OBESITY, EATING PATTERNS, AND PHYSICAL ACTIVITY OF ADOLESCENTS: A COMPARISON OF TWO RURAL COMMUNITIES IN NEWFOUNDLAND

JYOTI SHARMA

Obesity, Eating Patterns, and Physical Activity of Adolescents: A Comparison of Two Rural Communities in Newfoundland

By

Jyoti Sharma

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Abstract

Adolescent and childhood obesity is on the rise globally. Newfoundland has one of the highest overweight and obesity rates in Canada. The social determinants of health, which are interrelated influence this trend. These determinants were used as a conceptual framework in an attempt to understand how certain of the determinants influence overweight and obesity in adolescents in two rural communities with differing economic status. The aims of the study were to assess the prevalence of overweight and obesity; how physical activity and dietary intake differ in both communities; and how differences in practices, perceptions, barriers, and benefits related to physical activity differ in both communities. The sample consisted of a total of 107 grade 8 and 9 students ranging from 12-15 years of age who completed a self- administered questionnaire. Actual weight and height measurements were taken and recorded. Descriptive statistics, cross tabulations and logistic regression were used to analyze the data. While the communities varied on a number of characteristics there were few statistically significant differences. A high percentage of the adolescents were overweight (23%) and obese (37%) with males more likely to be obese and females were more likely to be overweight or of normal weight. Many of the students did not follow healthy eating patterns and frequently skipped breakfast, or did not engage in recommended levels of physical activity. In addition, a number of the adolescents had poor or unfounded attitudes towards physical activity. The findings have a number of important implications for community health nurses in areas of practice, education and research in addressing issues of overweight and obesity in adolescents.

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Chapter 1

Introduction

A continuing threat to health promotion and disease prevention among Canadians of all ages is the increase in overweight and obesity that is occurring nationally (Public Health Agency of Canada [PHAC]/Canadian Institute for Health Information [CIHI], 2011). Although increased body weight is thought to be problematic at any age, overweight and obesity in children and adolescents is increasingly being recognized as a major health issue in industrialized and developing countries around the world (Sassi, Devaux, Cecchini, & Rusticelli, 2009). Being overweight and obese has a negative physical impact on the health of adolescents (Swallen, Reither, Hass, & Meir, 2005) and often leads to certain medical conditions such as hypertension, cardiac disease, dyslipidemia, and type II diabetes (Twells & Newhook, 2011) that continue into adulthood where the physical burden of diseases related to obesity are well documented (Lopez, Mathers, Ezzati, Jamieson, & Murray, 2006; Reilly & Kelly, 2011).

While there is a general increase in the prevalence of obesity among the adolescent age group in Canada, a number of variations have been observed and one of these is geographical (PHAC/CIHI, 2011). This geographical variation is found not only among regions of the country, i.e., provincial variation, but within a single province, i.e., urban and rural differences (Siemen-Kapeu, Kuhle, & Veugeleur, 2010). Similar observations have been made in other countries (Liu et al., 2012; Sjöberg, Moraeus, Yngve, Poortvilet, Al-ansari, & Lissner, 2011). However, little research has been conducted on differences between different rural communities within a single province or geographical area. We

cannot assume that urban or rural areas of a province are homogeneous when it comes to overweight or obesity, so it is important to take a more in depth look at the regional level. This current study is an examination of overweight and obesity among adolescents in two different rural communities in Newfoundland and Labrador (NL) in one region of the province and some of the factors associated with these conditions among that age group in these communities.

Background

In 2011, NL had the highest rates of obesity in Canada at 29% and overweight at 40% (Human Resources and Skills Development Canada, 2012). Obesity in most age groups has gradually been increasing not only in NL, but nationally (Raines, 2004). Data from the 1978/1979 Canadian Health Survey and the 2004 Community Health Survey indicated that the percentage of adult obesity increased markedly from 13.8% to 23.1% of the Canadian population (Tjepkema, 2005). Using the same two surveys to compare national changes from 1978-2004 in children and adolescents between 2-17 years of age, the rate of being overweight went from 12% to 18% and the rate of obesity increased from 3% to 8% (Shields, 2005). Further increases have been observed in this age group and in the 12-17 years olds based on the findings from the 2009 and 2011 Canadian Health Measures Survey (Roberts, Shields, de Groh, Aziz, & Gilbert, 2012) with 19.9% of that age group being overweight and 10.2% obese.

Studies on children and adolescents in a number of the provinces are showing a similar upward trend. The National Longitudinal Survey of Children and Youth is conducted in Canada every two years and follows the same group of children over time. The first cycle was conducted in 1994/95 when the children were aged 2-11 and the third

cycle in 1998/99 (Statistics Canada, 2003). The survey used the international Body Mass Index (BMI) for age to determine prevalence of overweight and obese children. The prevalence is increasing as during the first cycle it was found that 34% were overweight and 16% were obese and in the third cycle 37% were overweight and 18% were obese. More boys were overweight and obese when compared to girls, more obese children were inactive, and low income was a contributing factor to childhood overweight.

This same upward trend in prevalence of overweight and obesity was also found in the youth of the United States. Ogden, Flegal, Carroll, and Johnson, (2002) examined the prevalence of overweight and obesity in that country by using data from a series of cross-sectional, nationally representative surveys. These surveys were conducted by the Centers for Disease Control and Prevention and contained data from 1971 to 2000. The authors reported that prevalence of obesity in children between the ages of 12-19 years increased from 10.5% to 15.5% from 1988 to 1994. Children between the ages of 12-17 had an alarming obesity prevalence rate of 21.7%. The World Health Organization (WHO) (2000) and Lau (1999) suggested similar trends in obesity in the United Kingdom, Asia, Australia, Brazil, and Africa. While some studies used different indicators, or a combination of indicators such as skin fold thickness and BMI to measure overweight and obesity, and used variations in the definition of overweight and obese, it is evident that more and more children and adolescents are becoming heavier and that this is a serious health threat if it continues into adulthood. If children are obese, they are more likely to remain so and become obese adults.

Significance of the Problem

Childhood obesity raises the prevalence of obesity in adulthood and can be linked to physical conditions such as heart disease, diabetes, cancer, musculoskeletal and dermatologic conditions, and pulmonary disorders (Must & Strauss, 1999; Serdula et al., 1993; Twells, 2005). According to The Organization of Economic Co-operation and Development (OECD) (2012) while the obesity rates for some countries have stabilized, e.g. Korea, England, and Switzerland, Canada is one of the OECD countries that has shown a larger increase of 4-5% in rates of obesity in the last decade. As the prevalence of obesity increases, so does the incidence of related diseases. The World Health Organization (2000) reported that in North America and Western Europe there is a mortality rate of half a million people from diseases related to obesity, and that morbidity is even higher.

Severe childhood obesity is associated with early signs of atherosclerosis, therefore, as the child ages she or he is at increased risk of cardiovascular morbidity and mortality (Tounian et al., 2001). Results of the Canadian Heart Health Surveys showed that the prevalence rates of dyslipidemia, hypertension, and self reported diabetes are 2 to 10 times higher among people with a BMI greater than 30 as compared with the lowest BMI (Lau, 1999). Consistent with the rates of obesity, the prevalence of type 2 diabetes as well as the mortality rates related to heart disease and stroke are also the highest in NL when compared to other provinces in Canada (Canning, Courage, & Frizzell, 2004).

There is a debate over whether or not obesity is a disease or a risk factor for disease (Heskha & Allison, 2001; Kopleman & Finer, 2001). Nevertheless, there continues to be a large amount of health care dollars spent on treating those with health complications

among the obese (Moffat et al., 2011). It is estimated that the annual health care cost in Canada associated with obesity has risen dramatically from $1.8 billion in 1997 (Birmingham, Muller, Palepu, Spinelli, & Anis, 1999) to 4.3 billion in 2004 (Katzmarzyk & Jannssen, 2004). A large proportion of health care spending in Canada is directed towards managing and treating co-morbidities related to obesity (Vanasse, Demers, Hemiari, & Courteau, 2006).

There is no available data regarding the cost of obesity in youth or adults in NL. However, as obese and overweight adolescents start to develop adult diseases that lead to chronic illnesses and disability in adulthood (Woffard, 2008; Zapata, Bryant, McDermott, & Hefelfinger, 2008), health care costs will increase (Birmingham et al., 1999). It has been estimated that 80% of overweight or obese children will remain obese into adulthood (Thunfors, Collins, & Hanlon, 2009).

While the physical health consequences of being obese and overweight have been well documented, it is important to also consider some psychological consequences. Overweight and obese children can face psychosocial and psychological issues that include depression, low self-esteem, prejudice, social isolation, barophobia, poor body image, and teasing and bullying. (McCrindle & Wengle, 2005). Children who are overweight or obese have been reported to have higher dissatisfaction with how they perceive their bodies and have an increased risk for poor self-esteem (Harriger & Thompson, 2012). Poor social functioning can result from these psychological consequences of increased body weight (Cornette, 2008).

If we are to address the many health problems and health care costs associated with overweight and obesity, it is important that we begin at an earlier stage in the

development of this problem. While it is ideal to begin as early in the child's life as possible to address overweight and obesity, during adolescence is a very important time as adolescents can begin to take greater ownership of their health and take on a more active role in addressing this important health problem. First it is important to conduct a study such as this to understand some of the determinants of overweight and obesity among this age group and how they differ within a particular region of the country.

Conceptual Framework

Health promotion incorporates the WHO (2003) definition of health and therefore any discussion of health promotion would include the social, mental, and physical barriers that may prevent individuals and communities from achieving and maintaining optimal well-being. By promoting health, nurses can help to empower individuals to gain control, improve health, and reduce their risk for disease, disability, and death. Health promotion strategies are developed and implemented based on determinants that influence one's health such as lifestyle factors, social circumstances, and personal behaviours. When initiating change in an individual's health perception or behaviour, influences from or barriers created by political, social, environmental, cultural, behavioural, economic, and biological factors need to be considered (Public Health Agency of Canada, 2012a). These external forces also known as the determinants of health, are not isolated factors, but rather are interconnected and influence health and choices available to individuals (Public Health Agency of Canada, 2012b).

The determinants of health underpin a population health approach that is often used in communities to inform disease prevention and health promotion. The focus moves from the individual to examine the health of the overall population. Individual qualities

and actions such as personal behaviour and knowledge are not the main concern, rather larger multifaceted, societal factors that influence health and well-being of populations take on increasing importance (Braverman, Egerter, & Williams, 2011; Segall & Chappell, 2000). Health or ill health is based not only on the individual's own resources but the resources of the community where they live. Lifestyle choices, for example, are not thought of as choices made independently from personal, social, and economic situations. Instead, they are patterns of choices made from first, the availability of choices, second, the choice to satisfy personal socio-economic conditions and lastly, the level of difficulty in making that choice (Butterfield, 1990). Essentially, health-promoting choices need to be easy to attain and less expensive than disease causing options if communities are to be healthy.

The conceptual framework for this study is based on a literature review that depicts the influence of many of the social determinants of health on overweight and obesity in childhood and adolescents (Johnson-Taylor & Everhart, 2006; Mikkonen & Raphael, 2010). Because of the complexities associated with the rise in overweight and obesity, it appears that there is no single one determinant that can be isolated as the major contributing factor. Many of the social determinants of health influence each other either directly or indirectly and can be linked to overweight and obesity, but very rarely are they independent factors, as the literature review will demonstrate. The model that follows demonstrates the influence of the social determinants of health on overweight and obesity. Research evidence has not clearly shown that one determinant has a greater impact on obesity or overweight than another because of the interrelationships among the various determinants of health. There are varying views on the actual degree of how a

single determinant affects overweight and obesity in childhood, however, most authors have concluded that as with other health behaviours none of the social determinants standalone (Bauman et al., 2012: Viner et al., 2012). In this study, I am not testing the model, I am attempting to understand the influence of certain determinants of health on overweight and obesity in adolescents in two rural communities in NL (see Figure 1).

Purpose and Research Questions

This study focuses on adolescents between the ages of 12-15 years in two rural communities located on the Avalon Peninsula of the island portion of NL. The two rural communities studied have unique characteristics that include a socio-economic status that differ from each other within the province. This study will provide data that will give needed insight into physical activity rates, diet, barriers to participating in physical activity and consuming a healthy diet, and student perceptions of their weight. Using this data, nurses, and health care professionals along with policy makers can start to understand the prevalence of overweight and obesity in these communities and some contributing factors and begin the process of addressing these problems. In this study I seek to answer the following research questions:

1. Is there any difference in the prevalence of underweight, normal weight, overweight, and obesity in adolescents (12-15 years) between the two selected rural communities?
2. How do selected determinants of overweight and obesity, e.g., dietary practices and physical activity, differ in the two communities
3. Are there differences in perceptions, barriers, and benefits related to physical activity in the two communities?

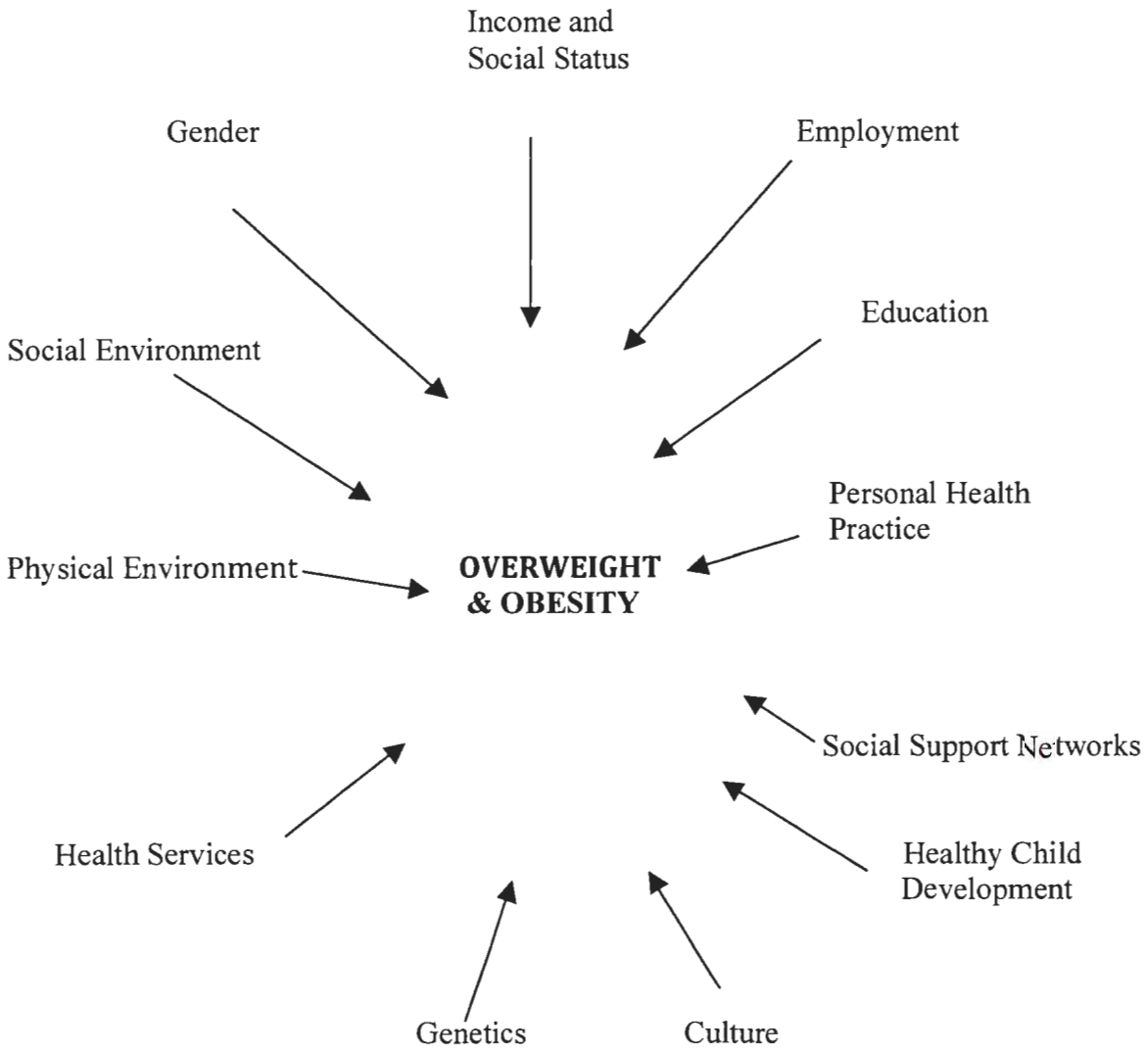

Figure 1. Conceptual Model: The Influence of the Social Determinants of Health on Adolescent Overweight and Obesity.

4. What are some of the predictors of adolescent overweight and obesity among these adolescents?

Definition of Terms

For the purpose of this study the following terms are defines as:

Adolescents - those students in grades 8 and 9, between the ages of 12 and 15 years.

Body Mass Index (BMI) - calculated by body weight (kg) divided by height (m) squared = BMI (kg/m2). In children/adolescents, charts for body mass index are used and represented in percentiles. These charts take into consideration, both age and gender for BMI (Centers for Disease Control and Prevention, 2012a). According to CDC:

> Overweight is defined as a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex.
> Obesity is defined as a BMI at or above the 95th percentile for children of the same age and sex. (CDC, 2012a http://www.cdc.gov/obesity/childhood/basics.html)

Physical Activity - is based on the number of times the students participated in physical activity lasting more than 20 minutes and at least three times per week. This activity also increased respiratory rate, heart rate, and caused sweating (Canadian Physical Activity Guidelines for Youth-12-17 years, n.d.).

Regular activity---12 or more times a month.

Irregular activity---11 or fewer times per month.

Dietary intake - food and food groups consumed by the student either regularly (eaten 4-7 times per week), frequently (eaten 1-3 times per week) or occasionally (eaten 1-3 times per month).

Chapter 2

Literature Review

The research on overweight and obesity is steadily increasing as we try and understand these complex problems. The amount of literature on overweight and obesity in adolescents in particular is growing as we address the challenges around the increase in weight in this particular age group. For the purposes of this chapter I have limited the literature review to research with children and adolescents, as they are often combined in a single study, and in particular I looked for any research that used the determinants of health included within my conceptual framework as predictors of childhood and adolescent. If the research clearly included only young children, i.e., under 5 years of age, I omitted that literature. There is a growing and vast literature on overweight and obesity in adolescence and it was not possible to review and include all the relevant articles, therefore I tried to capture any Canadian studies on the topic and to ensure I had good coverage of the determinants of health related to this problem. I searched for any reviews of research in selected areas and include a number of these. My literature search using bibliographic databases such as PubMed, EMBASE, and CINAHL with full text used keywords "obesity", "overweight", "adolescents" and "determinants of health" and determinants of overweight or obesity, as well as searching the individual determinants of health in connection to overweight and obesity. An additional important source of information is the many reports that the WHO and selected countries have published on overweight and obesity in childhood and adolescents.

The Determinants of Health

There are twelve key determinants of health that have been outlined by the Public Health Agency of Canada (2012b). These determinants of health and their relationship to obesity as found in the literature will be presented in this chapter. These determinants of health are (a) income and social status, (b) social support networks, (c) education and literacy, (d) employment and working conditions, (e) social environments, (f) physical environments, (g) personal health practices and coping skills, (h) healthy child development, (i) biology and genetic endowment, (j) health services, (k) gender, and (l) culture and ethnicity. Some of the determinants of health are usually addressed together in the literature and therefore will be listed in this chapter as follows: (a) income, social status, employment, education and literacy, (b) culture, gender and ethnicity, (c) biology and genetic endowment, (d) healthy child development and health services, (e) personal health practices and coping skills and (f) social and physical environments and social networks.

Much of the evidence for or association between a number of the determinants of health and overweight and obesity comes from a number of large scale national surveys that are designed to assess the health status of both adults and children in a particular country. An important consideration in these studies is nutritional status and often body weight is reported because of the association between body weight and health status. In Canada, a number of national cross-sectional studies have been conducted that survey children and adolescents with a focus on nutrition or physical activity. One of these is the Canadian Community Health Survey (CCHS). In 2004 the survey cycle was on nutrition. Another is the Canadian Health Measures Study (CHMS) (Tremblay,

Wolfson, & Gorber, 2007) that began in 2007 and collects data by both questionnaires and a variety of physical measurements. Adolescents are included as the target population in those studies that usually include individuals between 6 and 79 years. Data from these surveys were used for the report on Obesity in Canada (PHAC/CIHI, 2011). Other surveys are provincial or regional, such as the Research on Eating and Adolescent Lifestyles (REAL) (Story, Neumark-Sztainer, & French, 2002) in Eastern Ontario, School Health Action Planning and Evaluation System (SHAPES) (Cameron et al., 2007) in Ontario, and the Québec Longitudinal Study of Child Development (QLSCD) (Carter, Dubois, Tremblay, & Taljaard, 2012).

In the United States the National Health and Nutrition Examination Survey (NHANES) (Hedley et al., 2004) is one study that collects data through interviews and body measurements. Other studies are the Continuing Survey of Food Intakes by Individuals (CFSII) (Briefel, 1994), Youth Risk Behaviour Study (YRBS) (CDC, 2012b), and the Medical Expenditure Panel Survey (MEPS) (Cohen et al., 1996/97). The latter three surveys used reported height and weight of the children and adolescents. All are designed to be nationally representative. As in Canada some surveys in the U.S. are state or regional based. Project Eat (Eating Among Teens) out of the University of Minnesota (2012) is conducted in that state and The Youth Physical Activity and Nutrition Survey (YPANS) (Zapata et al., 2008) in Florida. Additionally the WHO conducts surveys on children and adolescents in 36 European countries through the Health Behaviour in School-Aged Children (HBSC) survey (European Environment and Health Information System, 2009).

Canada and a number of other countries take part in some surveys that are conducted worldwide. These surveys allow for comparison of health status among different countries. One such study is the Health Behaviour in School-aged Children (HBSC) (2012) survey. The HBSC is sponsored by the World Health and monitors the health of those 11 to 15 years and is conducted in 43 countries. Dietary practices are included in the survey. Much of the evidence on overweight and obesity and correlates come from these large-scale studies.

Income, Social Status, Employment, Education and Literacy

Income, social status, employment, and education and literacy are grouped together because they are often used either in combination or interchangeably to indicate socioeconomic status (SES). Income, employment or occupation, or educational achievement is often the measure that is used to predict the presence of overweight and obesity (Sassi et al., 2009). For children and adolescents it is often the parent's indicators of SES that are used.

Socioeconomic Status. Maiffeis and Tato (2001) noted that there was a relationship with low SES early in life and higher levels of adiposity in adulthood. Similar results were also found in a birth cohort study in Finland involving over 4,500 people that concluded that both higher SES and educational achievements were linked with lower levels of developing obesity (Eriksson, Forsen, Osmond, & Barker, 2003). It has long been postulated that children living in lower SES class, having a single parent, or having two obese parents were at higher risk for obesity (Wile & McIntyre, 1993), however, the findings from national surveys, do not always support these relationships.

In a study by Haas et al. (2003) and based on data from the 1996 MEPS, the researchers found that socioeconomic status was predictive of overweight in the children only group, i.e., those between 6 to 11 years, but not the adolescents. They found children in households with low income, defined as below the poverty level, were more likely to be overweight when compared to those who lived in households with higher income levels. For adolescents, aged between 12 and 17 years, those from higher income families were more likely to be overweight.

Wang and Zhang (2006) used data from studies conducted between 1971 and 2002 with the NHANES to determine if children and adolescents who lived in low socioeconomic families were more likely to be obese than those in higher socioeconomic families. They also looked at changes in the association between being overweight and family income over time. They divided their samples into low, medium, and high SES groups based on poverty income ratios that they devised. Their findings suggested that there was no increased risk of being overweight if one lived in a low SES household. Because they could look at changes overtime, i.e., a thirty year time period, a trend they highlighted was that the association between weight and SES was becoming less over time, at least among white adolescents. However, BMI has increased steadily between 1971 and 2002 across all age socioeconomic groups, suggesting the whole population is getting heavier.

Using the same data from the NHANES Freedman et al. (2007) specifically examined the relationship between family household income and overweight in children between two to 19 years. They used an "income-ratio" measure, which is based on family size and includes the number of children. They then categorized households based on a

poverty threshold according to the income-ratio measure. Income was associated with overweight in the children in that those below the poverty threshold had a 3% higher prevalence of overweight than those who were above this poverty threshold. As income went up BMI measurements decreased except among the black children, suggesting factors other than household income was the main influence. Ethnicity is increasingly being seen to be a confounding variable when trying to establish an association between SES and overweight (Sassi et al., 2009) and this factor will be addressed later in the review of research in this area.

Food Insecurity. Other researchers examining the effects of SES on body weight have focused on other indicators than those traditionally associated with SES. These researchers have used food insecurity or insufficiency (Alaimo, Olson, & Frongillo, 2001; Casey, Szeto, Lensing, Bogle, & Weber, 2001). Food insecurity, or a lack of access to sufficient food of good nutritional quality for healthy living, and food insufficiency, or not having enough food to eat, are often used as proxy variables for lower socioeconomic status because often access to food is directly related to economic factors. Alaimo et al. (2001) used data from NHANES to study the weight of children, food insufficiency, and family income in the US and noted a correlation between the latter two variables. They found those significantly at risk for being overweight were older non-Hispanic white children aged 8-16 years olds who lived in low-income households. When food insufficiency was used as a predictor variable there were no differences in weight status over all. However, when the researchers controlled for the confounding variable of ethnicity, younger girls aged 2 to 7 years experiencing food insufficiency were less likely to be overweight than girls of the same age in homes

without food insufficiency, while the reverse was found for older non-Hispanic white girls eight to 16 years, again suggesting ethnicity as a confounding variable.

Casey et al. (2001) used data from the CFSII to examine weight status of children aged between 0 to 17 years in food- insufficient low-income, food-sufficient low-income, and food-sufficient higher-income households in the U.S. In terms of BMI, food-insufficient low-income households had a slightly higher percentage of both children under the 10th and above the 85th percentile for body weights. The only significant difference was between the low-income and the higher income households with more overweight children in the former as compared to the latter households.

Dubois et al. (2011) conducted a comparative study on food insecurity and overweight in children aged 10 to 11 years in Quebec and Jamaica. Data were from national health studies in both countries (QLSCD and Jamaica Youth Risk and Resiliency Behaviour Survey) and used BMI as a measure of weight. Presence of food insecurity was collected through survey questions. There were a significantly higher percentage of overweight children in Quebec (26%) as compared with in Jamaica (11%). In Quebec if a child lived in a food insecure household the odds of being overweight was 3.03 times higher than if living in a food secure household. This was not the case in Jamaica as the odds ratio was 0.65 for being overweight in a household with food insecurity. Another difference noted in Quebec was by gender in that girls had an even higher chance of being overweight in food insecure households than their male counterparts. However no gender differences were noted in Jamaica. In the study they also compared overweight by SES of families and found that in Quebec low SES

families had a higher percentage of children who were overweight, however in Jamaica the highest percentage of overweight children were found in families with high SES.

A review of 21 studies from 1995 to 2005 on food insecurity and overweight (Eisenmann, Gundersen, Lohman, Garasky, & Stewart, 2011) led the authors to conclude that while food insecurity and overweight may be present together there is not a strong relationship. Although some of the studies they reviewed strongly suggested a link between the two, others were less conclusive. More research may be needed in the area. In food insecure households in certain families there does seem to be a higher prevalence of childhood and adolescent obesity, but ethnicity does seem to make a difference.

Similarly, Larson and Story (2011) reviewed 42 US based studies on food insecurity and overweight in children, adolescents, or adults excluding elderly. Over one half of their studies included children and adolescents. Their review was limited to studies published in the past decade. The overall results were not strongly suggestive of a link between food insecurity and overweight in children and adolescents, but there were some studies where the results supported this link. What they did find more consistently was a link between adult women and overweight in these food insecure households. Ethnicity may have been a confounding factor in that food insecurity at least in the US was more common in Black and Hispanic families.

The section above on food insecurity demonstrate that dietary intake in these families is greatly affected. Drewnowski and Specter (2004), found that high fat, energy dense foods are less expensive than lean meats, fresh fruit, and vegetables. Therefore, fresh foods are less likely to be bought by families facing financial hardships such as single parent run households.

Education. Parental education level has been consistently inversely associated with body fatness in children (Shrewbury & Wardle, 2008). In Nova Scotia, a study conducted by Veugelers and Fitzgerald (2005), evaluated the prevalence of overweight and obesity in relation to parent's education. Participants were chosen from 282 schools and included 4298 students in the fifth grade and their parents living in that province. All socio-economic status information such as marital status, income level, educational level, and residency was obtained from the parents in the form of a questionnaire. The study demonstrated that with respect to education, children whose parents achieved higher levels of education were at decreased risk of being overweight. Those with higher education also had better jobs and higher income levels. The relationship between education, income and weight is vital when determining at risk groups for becoming obese based on SES.

A study conducted in six Latin American cities found that socio-economic status affected knowledge of obesity in adolescents (McArthur, Peria, & Holbert, 2001). The authors used an anonymous, self-administered questionnaire containing demographic questions and a multiple choice obesity test. It was found that although there was a low level of obesity, knowledge among adolescents from both higher and lower socio-economic status groups in all six cities. There was a trend for higher scores in children from wealthier families. Knowledge was weakest in the area of food preparation and the relation of obesity and health in adolescents from a higher socio-economic status. Adolescents that belonged to the lower socio economic groups had insufficient knowledge in the area of fat and calorie content of foods and beverages and the relationship between obesity and health. Therefore the adolescents from lower socio-

economic groups may have had more difficulty in choosing foods that are lower in fat and calories because of a knowledge deficit and this could possibly be one of the contributors to obesity.

In Australia, Coveney (2005) compared general knowledge related to diet and health of parents from high and low-income households. Parents from 40 households in two socio-economically distinct suburbs were interviewed and there was a great difference in knowledge between both groups related to dietary intake and food habits of children. Parents from higher income brackets were able to discuss the importance of food and their children's health from a more scientific approach that was related to current knowledge of nutrition. Lower income parents were more likely to discuss nutrition as something that allowed their children to function daily or how it affected their physical appearance. Higher income and well educated parents also recognized the potential long term health risks related to diet and nutrition whereas, low income, less educated parents simply linked dietary intake to body composition rather than other health implications.

The research conducted by Coveney (2005) on the importance of education in health noted that there is a difference in knowledge between high and low-income earning homes. A need for more education specifically in disadvantaged groups to combat the growing problem of overweight and obese children is needed for prevention but is also a challenge. It is vital when BMI of Canadians are increasing and children today may be at risk for having a shorter life expectancy than that of their parents because of the chronic diseases associated with obesity.

Gender and Culture

The determinants of gender and culture have been grouped together because in some of the studies located on overweight and obesity in children and adolescents, often ethnicity, which can be used to some extent as a proxy variable for culture, is a confounding variable when attempting to determine the association between a variable of interest and overweight and obesity along gender lines (Alaimo et al., 2001; Freedman et al., 2007).

Gender. The associations between gender and body weight have been well documented in the literature. In almost all of the studies reviewed males have been found to have the higher rate of both overweight and obesity across age groups. In 1997, Marshall and Bouffard found that 33% of boys and 24.2 % of girls between the ages of 5-6 years and 9-10 years living in Edmonton, Alberta were obese. Ball, Marshall, Roberts, and McCargar (2001), also investigated 6-10 year olds living in the same city and found 20.3% boys and 17.9% girls to be overweight. Other regional studies conducted in parts of Quebec found the same trends. For example, in northern Quebec 38% of boys and 33% of girls between the ages of 9-15 years were either overweight or obese (Bernard, Lavalee, Grey-Donald, & Delisle, 1995). While in Montreal, Quebec among 9-12 year olds, 24.2% were somewhat overweight, 15.7% were moderately overweight, and 38.8% were very overweight (Johnson-Down, O'Loughlin, Koski, & Gray-Donald, 1997). A second study in the same area focused on children from 10-12 years and found that 68.2% were overweight and 28.4% of boys and girls were obese. In all studies boys were more overweight and obese than girls. In Northern Ontario, 20.8-28.6% of boys and 12.3-29.4% of girls between 5-19 years were considered obese

(Katzmarzyk & Malina, 1998). In the same province among children and adolescents between 2 and 19 years 24.7% of boys and 33.7% of girls were overweight (Hanley et al., 2000).

Research on a national level in Canada, used surveys from 1981 and 1988 revealed a rise in obesity, in boys, the prevalence increased from 8.7%-15.5% to 13.6%-22.0% and in girls the prevalence increased from 8.8%-16.9% to 13.0%-26.9% among children between ages 7-12 years (Limbert, Crawford, & McCargar, 1994). Overweight in 7-13 year olds increased during the period 1981 to 1996 in boys from 15.0%-35.4% and in girls from 15.0%-29.2%; obesity rates also increased in those years from 5.0%-16.6% in boys and dropped in girls from 16.6% to 14.6% (Tremblay & Willms, 2000).

Culture. With the changing composition of the North American population one of the variables that is getting closer study is that of ethnicity and how it is associated with overweight and obesity. Ethnicity may have an impact on obesity because of the possible differences in genetic compositions of people living in different geographic locations and environments (Beamer, 2003), but may also be related to food consumption patterns, beliefs about physical activity, and beliefs and values about ideal body weights. Along with the differences in physical make up there are differences in dietary intake that is influenced by varying life style behaviours and socio-economic status among ethnicities and cultures (Tremblay, Perez, Ardem, Bryan, & Katzmarzyk, 2005). In non-western cultures food and weight itself may have different significance (Dapi, Omoloko, Janlert, Dahlgren, & Haglin, 2007).

In the United States overweight increased fastest in minorities and southerners, while the number of children with BMIs greater than 85th percentile increased

significantly in the period 1988 to 1998, particularly among African American and Hispanic children, and non significantly among white children (Strauss & Pollack, 2001). Slusser, Cumberland, Browdy, Winham, and Neuman (2005) undertook a cross sectional study in the Los Angeles Unified School District with 119 students from low income backgrounds and ranging from 7-11 years of age. Children with the highest percentage of obesity were African American followed by Hispanics from a sample that also included Asian Americans and Caucasians. This is similar to observations of others on the relationship between ethnicity and obesity (Asante, Cox, Sonneville, Samuels, & Taveras, 2009).

Gender and Ethnicity. Within different ethnicities, obesity rates by gender also vary. There are disparities among women, children, and adolescents in the United States. Black women tended to be more overweight than white women and 65% of white girls and 84% of Black girls became obese adults in comparison to 71% and 82% in boys respectively (Wang & Beydoun, 2007). In Black women obesity continued to increase at a faster pace in high and medium SES groups when compared to low income groups between 1976-1980 and 1999-2002. When comparing the data from1988-1994 and 1999-2002 white men in low SES groups had a decreased prevalence of obesity whereas black men had increased and at a much higher rate (Wang & Beydoun, 2007).

In Canada, there is a strong correlation between ethnicity and prevalence of overweight and obesity and this exists even when accounting for age, socio-economic status, physical activity and birthplace. The Canadian population consists of 20% born outside the country and 16.2% are visible minorities (Statistics Canada, 2009). The highest prevalence of overweight and obesity is seen in Aboriginal people for both

genders (Katzmarzyk & Malina, 1998; Ng, Corey, & Young, 2011). Asians in all categories for males and females were least likely to overweight or obese.

Biology and Genetic Endowment

Although a number of social factors contribute to the problem of excess body weight, they cannot fully account for the obesity observed in individuals and their families. Some of the observations of obesity in families suggest that biology and in particular genetics is at play. In Canada children of obese parents are at high risk for obesity in youth (Carriere, 2003). The research team of Katzmarzyk, Perusse, Rao, and Bouchard (2000) has tried to establish in the Canadian population what is the familial risk of being overweight or obese. Katzmarzyk et al. (2000) suggested that in Canada there is considerable familial risk of being overweight or obese; children with extremely obese parents are at much greater risk themselves. In another Canadian study the authors also found a strong correlation between adiposity of parents and their children and more so among lean and obese children (Katzmarzyk, Hebebrand, & Bouchard, 2002). This study showed that there is a predisposition of obesity in children of parents who are obese and of leanness in children whose parents are lean.

That genetics contributes to obesity has been well accepted (Bouchard, 2009). What is less clear is how much genetics contribute as estimates vary (Loos & Bouchard, 2008). Genetics is thought to account for 25-40% of obesity rates, however, the determinants are complex (Anderson, 2000). With advances in genetic research in more recent years one of the areas of research focus that researchers have been able to pursue has been on the role that biology and genetic endowment plays in obesity. Identification of the FTO (fat mass and obesity associated gene) has helped establish the fact that some

individuals may be predisposed to develop obesity at some point at least among Caucasians and possibly other ethnic groups as well (Loos & Bouchard, 2008). Through the advances in genetic research there is at least a greater understanding of the complexity of genetics of obesity (Choquet & Meyre, 2011).

Obesity with a genetic basis is classified as either monogenic or single-gene (effects come from a single gene location) or polygenic (effects from genes at multiple locations) obesity; however there is also some overlap between the two types of obesity. Conditions related to the former are syndromes, e.g., Prader-Willi syndrome, where obesity is one of the main clinical features or the disorder (Bouchard, 2009). These are the less common forms of genetic obesity. More common forms of obesity with a genetic basis are polygenic, such as FTO. Researchers are also beginning to understand the role of genetic factors in obesity (Choquet & Meyre, 2011) in that some genes act on what are known as "central regulators of food intake" in that individuals affected do not recognize feelings of satiety, have preferences for specific food (nutrients), or slower food metabolism rates.

Healthy Child Development and Health Services

Just as childhood and adolescent overweight and obesity tends to contribute to overweight in adulthood, if we are to prevent these conditions in adolescents we need to look at developments in infancy and early childhood and how these affect weight in adolescents. Less research has been done this determinant of overweight and obesity than some of the other determinants reviewed.

Healthy Child Development. Johnson-Taylor and Everhart (2006), reported on a workshop that was held to review the research examined environmental and behavioural

determinants of overweight in children and adolescents. The workshop was held in 2004 and sponsored by The National Institute of Health in the U.S. Three areas of health child development stressed were breast-feeding, infant feeding especially the early introduction of solids, and dietary intake early in life. Because a meta-analysis of the association of breast feeding with increased weight demonstrated that breast-feeding may be protective against obesity in children, they concluded this was a way to promote healthy child development. However, since they did not find an association between early introduction of solids and childhood obesity, they felt that they could not include this as a risk factor for obesity. Dietary intake has focused on the role of higher protein, fat, carbohydrate, and total caloric and energy intake early in life, i.e., first two years, and risk of obesity later in childhood. Through a review of the research with each of these nutrients in young children, only high early protein intake was positively associated with risk for obesity. Since not all the research areas had consistent findings the conclusions were somewhat tentative.

Food consumption patterns are often learned in early life and continue into adolescence and adulthood. The authors did acknowledge that early parenting behaviours towards food and food consumption as well as physical activity were important in early childhood development if we are looking at determinants of childhood and adolescent overweight (Johnson-Taylor & Everhart, 2006). With infants and younger children parents set portion size and patterns of meals and snacks, including what kind of snack foods are acceptable, as well as preferred foods. If children grow up in households where fruit and vegetable consumption are low to non-existent, chances are this will continue into adolescent and maybe adulthood. Similarly, if parents do not engage in much

physical activity and do not make opportunities available to their children from a younger age, unless schools have a positive influence on the older child and adolescent, some patterns get set. Patterns and values of parents and children can be very similar so healthy child development requires paying attention to both dietary and physical activity practices and patterns.

Health Services. To what extent health services for children and adolescents focus on healthy body weights and how to maintain these is uncertain. No doubt most health care professionals would agree that prevention is the best way to deal with obesity, however, primary health interventions are required to deal with the current problem of overweight and obesity in youth and to carefully examine those that show most promise in dealing with the problem. Much work needs to be done to establish research-based obesity prevention programs that can be used more widely (Haynos & O'Donohue, 2012).

Since 1997 in the United States there has been an Expert Committee on the prevention, assessment, and treatment of child and adolescent overweight and obesity (Barlow, 2007). This Committee considers the evidence in order to make recommendations for treatment of the problem. In the latest report the Committee suggested there is consistent evidence for health professionals to recommend such dietary practices as decreased consumption of sugar-sweetened drinks, increased consumption of fruits and vegetables, daily breakfast, limited fast food restaurant foods as well as limiting television viewing as ways for preventing and treating obesity in this age group. As well they suggested using a model of chronic care rather than an acute care approach for this model of care. A systematic review of treatment for obesity suggested

the more promising strategies for short term successes are moderate to intense treatment programs aimed at behavioural changes to increase the likelihood of losing weight and include losing weight slowly, setting realistic goals, and avoiding food as a reward (Whitlock, O'Connor, Williams, Beil, & Lutz, 2010).

The recommendations of five expert groups, including the 2007 Canadian Clinical Practice Guidelines on Childhood Obesity were reviewed (Kirschenbaum & Gierut, 2012). All five group statements supported the use of intensive counseling in three areas; (1) dietary; (2) physical activity; and (3) cognitive-behavioural factors. Educational approaches only were felt to be insufficient. There is also the issue of having physicians aware of these guidelines and using them in practice. In the Midwestern states in America, 71% of 194 physicians surveyed were aware of the 2007 Expert Committee Recommendations and these physicians were in compliance with the majority of recommendations (Harkins, Lundrigan, Spresser, & Hampl, 2012). All physicians expressed a desire to learn more on how to motivate adolescents to achieve compliance with the guidelines they used.

It is important to include the family in any approaches to deal with childhood and adolescent overweight and obesity and to look at best practices to do so. Sung-Chan, Sung, Zhao, and Brownson, (2012), performed a systematic review on randomized controlled trials of family-based approaches. They included 15 studies in their review on four different models: 1) Behavioural approaches that included usually one parent and focused on lifestyle related to diet and increased physical activity; 2) Behavioural approaches with education on parenting and how to manage child behaviour; 3) Family-based therapy; and 4) Family-based therapy with psycho-educational approaches. Their

review suggested that the behavioural approach with involvement of one parent was the most effective, however, there were fewer of the other models of care that made their stringent criteria for inclusion in the review.

Even though most health practitioners would agree that non-surgical measures would be the best means of working with adolescents who are overweight or obese, for some adolescents who are markedly obese and having health complications related to this obesity, bariatric surgery may be the best alternative (Barnett, 2011; Hsia, Fallon, & Brandt, 2012). While the guidelines for this surgery need to be carefully followed, there seems to be comparable results for adolescents and adults, however the long-term effects remain to be seen (Hsia et al., 2012).

One of the challenges of health services especially for treatment of obesity in children and adolescents is the different perceptions of the youth themselves with the problem, their parents, and their health practitioners about awareness of the problem for diagnosis, understanding of the causes of obesity, and how treatment approaches are seen (Lachal et al., 2012). Adolescents seem to depend more on social reactions to obesity, such as bullying or isolation, while parents and health professionals respond to health problems in order to classify obesity as a problem that needs treatment. General practitioners often feel they do not have the skills required to deal with the problem of obesity and parent's concern is that they will upset their child if they bring up the problem, so often treatment is delayed or not fully addressed (Lachal et al., 2012). All three groups agree that the best approach is family-centered treatment.

Personal Health Practices and Coping Skills

Much of the research on the factors that correlate with overweight and obesity in adolescents would be categorized under personal health practices and coping skills. These studies tend to focus on some aspect of dietary intake or physical activity and relate those to the weight of the participants that is either measured or self-reported. Sometimes both health practices are included in the same study. Dietary intake studies often use fruit and vegetable consumption and how that affects health (Lowry, Lee, McKenna, Galuska, & Kann, 2008; Zapata et al., 2008). Physical activity encompasses both activity and inactivity.

Dietary Intake. Part of being overweight or obese is a shift toward positive energy balance, that is, increased food consumption combined with decreased or insufficient physical inactivity (Anderson, 2000). This shift has been noted in changing diets and activity levels around the world. Whole grains, fruits, and vegetables have been replaced by refined grains, fats, and sugar and these refined foods currently account for 50% of North Americans and Europeans daily caloric intake (Chopra, Galbraith, & Darnton-Hall, 2002). Thus caloric intake is generally increased for most individuals. The school environment by not restricting certain foods perpetuates the problem. In U.S. schools 64.7% offered drinks containing sugar and 54.1% food choices that were less than healthy as possible food choices for youth attending these institutions (Hedley et al., 2004).

Researchers have attempted to establish the relationship between calorie intake and weight status in children and adolescents. Using NHANES data Skinner, Steiner, and Perrin (2012), found that for the young children, i.e., those under 6 years there was a

significant and positive correlation between overweight and obesity and higher caloric intake but for adolescents the converse was true. Both groups were compared with children and adolescents who were deemed to have a healthy weight.

de la Hunty, Gibson, and Ashwell (2013) conducted a systematic review on research that attempted to determine if the regular consumption of cereal for breakfast was associated with higher risk of obesity. They included 14 research articles in their met-analysis and concluded that children and adolescents who had a greater frequency of breakfasts with cereal consumption had lower BMIs indicating a positive relationship between cereal consumption and lower weights.

Rather than examining overall caloric intake some researchers have examined single items in the diet such as fruit and vegetable or soft drink consumption or sugar. In a large sample of children and youth in Manitoba (n=1172) aged between 2 and 17 years those children who consumed 5 or more servings of fruit and vegetables were less likely to be overweight and obese than those who consumed under 5 servings daily (Yu, Protudjer, Anderson, & Fieldhouse, 2010). It is possible that in families where more attention is given to healthy eating, other aspects of health such as physical activity might have increased attention.

Danyliw, Valanparast, Nikpartow, and Whiting (2012) studied the beverage consumption of Canadian children and adolescents aged between 2 to 18 years to determine the relationship with body weight. Generally they found no relationship except for boys aged 6 to 11 years who had an increased chance of being overweight or obese if they consumed high amounts of soft drinks compared with those who consumed moderate amounts of these beverages.

Activity Levels. The WHO (2012) defines physical activity "as any bodily movement produced by skeletal muscles that requires energy expenditure. While there is general agreement that there is an inverse relationship between BMI and level of physical activity and that the obese are more inactive than non-obese the casual relationship is not well established (The WHO, 2000). The current Canadian Physical Activity Guidelines recommends at least 60 minutes of moderate to vigorous physical activity each day for adolescents aged 12-17 years (www.csep.ca/guidelines). A national comparison of physical activity for Canadians showed the lowest rates of inactivity were found in British Columbia, Alberta, and the territories and the highest rates were found in Quebec, New Brunswick, Prince Edward Island, and NL (Canadian Institute of Health Information, 2004). Physical inactivity or decreased energy expenditure is claimed to be a risk factor for obesity.

Not only in some provinces of Canada is physical activity levels of all age groups thought to be decreasing over time, the levels of physical activity is occurring at less than recommended levels. Levels are also associated with particular events outside the home, such as school attendance for adolescents (Canadian Physical Activity Guidelines for Youth-12-17 years, n.d). Among youth and adolescents, members of this age group, i.e., 6-19 years, are more likely to engage in recommended physical activity on weekdays (average of 57 minutes per day) than weekends (average of 47 minutes per day). The peak time for the weekday activity is the time just after school. Gender differences are noted in that boys have been found to engage in physical activity significantly more than girls. As well those in the obese category are less likely to engage in physical activity than those of normal weight. These authors estimate that less than 10% of adolescents

and youth meet the recommended guidelines for physical activity on a daily basis. These data compare to those reported by Physical and Health Education Canada (2013) in that they reported 87% of this age group did not meet the recommended amount of physical activity.

Using the same data as previously cited, Colley and others (2011) attempted to measure level of physical activity in children and youth aged 11 t0 19 years through the use of an Accelerator that these participants wore. Those who wore the Accelerator for 4 days or more were included in the study. They found that the number of minutes of physical activity declined for overweight and obese boys but not for the girls, which was already lower than their male counterparts. As well the amount of activity declined by age in that older children and youth took part in less activity than younger children.

The findings of Garriquet and Colley (2012) about the peak hours of physical activity and the weekday versus weekend differences in physical activity suggest schools are important. However, many provinces have been cut spending on education, despite rising enrolments. Ontario spent $900 million less 1998-1999 than in 1994-1995 and Quebec reduced its annual spending by $800 million. These budget cuts created stress for many schools in attempting to balance their books and programs such as physical education, music, and art; all deemed as frills in the school system. The problem worsens when in higher grades physical education becomes optional. In 2001, 54% of schools reported that they had a policy to provide daily physical education classes only 16% were meeting this requirement (Canadian Institute for Health Information, 2004).

The same trend has been noted in the U.S., where despite a very public concern being voiced over the rising rate of obesity, physical education time has been decreasing

in some US schools (Baker, 2012). A report by the National Association for Sport and Physical Education and the American Heart Association (2012) shows that mandated physical education in high schools has decreased over time. In 2010, 92.2 % of the 51 U.S. states had mandated physical education in high schools and in 2012 this had dropped to 86.3% of the states; a drop of 5.9% of the states in a two year period. The concern here is that not having mandated physical education gives the message that physical education is not important. Additionally it is happening at a period in the young person's life when they ought to be learning life skills for after they complete school and go into an environment where physical activity will be their choice.

Bauman et al., (2012) have reviewed a number of research studies on factors related to physical activity. While more work is needed on predictors of physical activity in all age groups, they did report that there were no relationships noted between body measurements (e.g., BMI) and physical activity in adolescents. Psychosocial factors were important correlates in that adolescents with good self-efficacy scores were more likely to have increased physical activity. Likewise those adolescents who held positive perceptions of their ability to be physically active were more likely to engage in more activity. One of the predictors of physical activity in adolescents was previous level of physical activity in childhood.

Research over the last 25 years has linked inactivity in children and adolescents to television viewing and later to the use of computers and playing video games (Danner, 2008; Dietz & Gortmaker, 1985; Barlow, 2007; Steffen, Dai, Fulton, & Labarthe, 2009). These activities lead to sedentary behaviours that not only result in a lack of using much energy but increases the likelihood of consuming more calories or being exposed to

commercials on food consumption. Researchers examining increased television viewing have found that parental weight may be a factor in that in one study overweight in parents resulted in greater screen time than if parents were of normal weight (Steffen et al., 2009). It has also been found that increased hours of playing video games increased the risk of being overweight in both genders even after adjusting for socio-economic status (McMurray et al., 2000).

Social and Physical Environments and Social Networks

A population-based approached requires that close attention is paid to the environments of the particular group under study. Adolescents' social environments and their social networks influence their practices and attitudes towards body weight, dietary practices, and exercises. Just as the social environment is increasingly being recognized as contributing to overweight and obesity, physical environment that incorporates the built environment is increasingly being recognized as an important correlate with overweight and obesity in children and adolescents (Frank et al., 2012; Saelens et al., 2012).

With the use of Geographical Information Systems (GIS) technology it is possible to measure factors in the physical environment that contribute to an "obesogenic" environment, e.g., physical access to good sources of nutrition, such as supermarkets versus high density fast food outlets and ease of walking in a neighbourhood or walkability and access to high quality parks (Frank et al., 2012). In actual measures in two U.S. cities, it was clear that for obesity in children aged 6-11 years, but not so much for overweight children, near distance to supermarkets, good walkability and nearness to

good parks, and further distance from fast food outlets showed a positive correlation suggesting the importance of the built environment (Saelens et al., 2012).

A similar study done by Block, Scribner, and De Salvo (2004), focused on the prevalence of fast food restaurants in black versus white neighbourhoods within New Orleans, Louisiana from data collected in 2001. It was found that there were 2.4 fast food restaurants per square mile in predominantly black neighbourhoods versus 1.5 fast food restaurants per square mile in predominantly white neighbourhoods. Overweight and obesity are more common in black children than weight, suggesting ethnicity, but this study draws attention to physical and social environments and what is contained in these environments.

According to Gordon-Larsen, Nelson, Page, and Popkin (2006), not only is food access an issue in lower SES and minority or ethnic groups, access to recreational facilities for physical activity is also limited. They assessed the geographic and spatial distribution of physical activity facilities and how disparities in accessibility may underlie adolescent overweight patterns. Using data from wave 1 of the National Longitudinal Study of Adolescent Health, 20,000 students in grades 7 to 12 from 80 U.S. high schools and 52 middle schools were used in the study by Gordon-Larsen et al. (2006). The researchers found that lower SES and high minority areas had reduced access to physical activity, which in turn was associated with decreased physical activity and overweight.

Research reviews have focused on fast food availability in the local environment and relationship to obesity (Fraser, Edwards, Cade, & Clarke, 2010). In the review by Fraser et al. (2010), which included 33 studies on fast food availability and obesity in

children and adolescents, they found that in the 12 studies conducted at a population level, the results were mixed. In these 12 studies 6 had a significant positive association between the two variables, 2 had a significant negative, and in 5 studies no association was found. They did report that fast food outlets were more frequently located near deprived neighbourhoods where overweight and obesity is often higher.

In at least one Canadian province, Carter et al. (2012) using the QLSCD tried to assess the importance of "place" for weight gain in children. Their study included physical and social environmental measures. Those children in materially deprived neighbourhoods as measured by low educational levels, higher unemployment, and low average income showed increased weight gain when compared with areas where the opposite was in effect. However, they did not find the same results for children living in areas they classified as lacking social cohesion, e.g. having a higher percentage of households with single adults or having social disorder, e.g. more social problems. Their findings suggest the importance of considering social and environmental environments together.

Earlier research into the importance of physical environment included contrasting the prevalence of overweight and obesity between urban and rural children and adolescents and examining the factors that contribute to these conditions in the varying physical environments. Among a large cohort of students (n= 25,416) in grades 9-12 in 76 schools, who took part in the cross-sectional SHAPES-Ontario study, rural adolescents were more likely to be overweight and obese than either their urban or suburban counterparts (Ismailov & Leatherdale, 2010). However, there were gender differences in the prevalence of overweight and obesity. First, across gender, males in all

three geographical areas were more likely to be overweight and obese than the females. Second, within geographical areas the prevalence of overweight and obesity by gender varied by region. Urban males were more likely to be overweight than both rural and suburban dwelling males. Among the females prevalence of overweight was highest for rural areas, second highest for those in the urban areas, and lowest for the suburban females. Suburban males had slightly higher prevalence of obesity with first urban and then rural males following closely in descending order. For the females the rural adolescents were significantly more likely to be obese than the urban and suburban in that order. The less these adolescents viewed television the less likely they were to be either overweight or obese.

Down et al. (2012) examined the change in adolescent's weight and their environment in a study in Alberta. They did a web-based survey in 2005 and again in 2008 to look at changes in urban and rural adolescents in terms of both differences between the two groups and changes over time in body weights that were self-reported, food consumption, and exercise. They found that urban adolescents had better nutrition than their rural counterparts, e.g., more fibre and less saturated fat. Two positive findings were that there was an increase in the percentage of adolescents in the rural area that were at normal weight and reported an increase in physical activity. These findings were not noted in the urban adolescents.

Obesity prevalence is calculated to be higher in rural and remote northern communities (Rosenbloom, Joe, Young, & Winter, 1999). People living in urban centres are less likely to be overweight and obese than their rural counterparts. Possible trends for this trend include less money for healthy foods and activities, race and culture, low

level of education, and decreased accessibility to health care professionals. Obesity is classified as a risk factor for poor health status and is measured by disability free life expectancy (DFLE) and life expectancy (LE). The direct rate of obesity is not calculated in this report, however, LE and DFLE is calculated to be lowest in northern communities and highest in urban areas. Additionally, level of education is considered to be protective (Shields & Tremblay, 2002). Surprisingly, Type 2 diabetes, a consequence of obesity, is also linked to socio-economic status and until recently has been attributed in children to ethnicity. However, new evidence suggests that while aboriginal children continue to have the highest prevalence of Type 2 diabetes the rates in children of urban, rural, and world wide are catching up (Rosenbloom, et al., 1999).

Based on a survey with self-reported heights and weights completed in 2000-2001, about 25% of off-reserve Aboriginal adults are obese, there appears to be some evidence that obesity rates may be higher on reserves in selected First Nations communities (Canadian Institute for Health Information, 2004).

Conclusion

In conclusion, from the research on overweight and obesity and the determinants of these conditions, it is evident that overweight and obesity among adolescents is a complex issue. From a review of selected research on the following determinants of health: income and social status, social support networks, education and literacy, employment and working conditions, social environments, physical environments, personal health practices and coping skills, healthy child development, biology and genetic endowment, health services, gender, and culture, it is clear that all of these

determinants have been studied, usually in combination, in relation to overweight and obesity in adolescents.

All have been implicated in one way or another in overweight and obesity, however, often the findings from a systematic review on any particular factor, has shown mixed results and is therefore inclusive. Lower socioeconomic status has been associated with the problem but is more marked in the presence of food insecurity and with groups of certain ethnic origin. The latter may be related to culture and beliefs and practices around food consumption patterns and body weight. Genetic research related to overweight and obesity is increasing as is the research into early child development and these are showing that both may contribute to the problem, but again it is important to examine the social and physical environments of those affected. There have been studies showing urban and rural differences, including in Canada, with usually more overweight and obese adolescents in the rural areas. However, no study was located that looked at differences within a single rural area. The present study will contribute to how overweight and obesity might vary within rural areas of NL.

Chapter 3

Methods

The purpose in this chapter is to provide an overview of the methods used for this study, which was conducted in rural NL with students living in two different communities on the east coast of the province. This chapter provides an overview of (a) design, (b) settings, (c) sample selection, (d) data collection, (e) instruments, (f) data collection procedure, (g) data analysis, and (h) strengths and limitations including reliability and validity of the data, and (i) ethical considerations.

Design

The study conducted was descriptive, co-relational, and cross-sectional in design. There were no control groups, no pre-tests, and no random assignment of subjects. The study was on the prevalence of overweight and obesity in a group of adolescents in grade 8 and 9 and the relationship with dietary intake and physical activity patterns, as well as their perceptions of, barriers to and participation in physical activity.

Settings

The study was conducted in high schools in two communities that are identified as Community A and Community B. Schools and in particular health classes have been noted as a comfortable and convenient environment to conduct research related to student's health (Lamb & Puskar, 1991). There is one high school in each of the communities for the students who are either living within the community or in the surrounding smaller communities.

For this particular study the advantages of performing research at school included (a) convenient access to the population of interest, (b) questionnaires completed simultaneously without students consulting with their peers, and (c) obtaining student measure of height and weight after questionnaires were completed using standardized equipment. Each student completed the questionnaire in the gymnasium and following completion of the questionnaire was measured for height and weight in an adjacent area that provided privacy and confidentiality.

These two specific communities were chosen from several communities in a particular geographical area because of the differences in parental income and education levels in the communities, providing for an interesting comparison. Personal income per capita in Community A was $21, 400 in 2003 and in 2006 it was $24,200; higher than the provincial figures of $19,800 and $22,900 in the same years respectively. Income in community B was lower at both times with personal incomes per capita in 2003 being $16,300 and in 2006 was $17,900. The Canadian income per capita in 2006 was $28,900 according to the Community Accounts (Newfoundland & Labrador Statistics Agency, 2010). Community A had higher levels of education with 11.7% having a university degree in the age group of 18 to 64 years versus 10.3% in Community B in the same age group. In terms of holding a college education that included graduating with a certificate or diploma, 10.9% residents in Community A and 11.3% residents in Community B fit in that category. There was little difference in residents with a high school diploma in Community A (25%) when compared with Community B (24%). The largest disparity in education was seen in residents that did not graduate from high school in both

communities, Community A had 28.9% and Community B had 39.4% who had not completed high school.

Sample Selection

The sampling method used was a convenience sample and any student that met the selection criteria was invited to participate. Originally, grades 10, 11, and 12 were chosen to be part of the study, but because the dates for planned data collection coincided with preparation classes for up coming final examinations, the school board denied access to the group of students in grade 12 and students in grades 10 and 11 did not have physical education classes, which would have allowed me to collect data during that time. Students in grades 8 and 9 were accessible because the schools provided the physical education class time for the study thus not interrupting course work. All students in grades 8 and 9 were invited to participate in the study. Some of the challenges accessing students for this study were similar to those reported in the literature, such as, accessing and recruiting participants, gaining informed consent from parents and students, finding a convenient place and time to conduct the study, building nurturing, strong, collaborative relationships with school administrators, guidance counsellors, teachers, and coping with the unpredictable (Puskar, Weaver, & DeBlasso, 1994).

The target population in Community A was 57 students and in Community B the target population of students was 63. The number of participants in the study comprised of 50 students from Community A and 58 students from Community B for a total number of 108 students. One student did not participate in the measurement for height and weight and since this was the dependent variable in the study that participant was dropped from

the study, thus the findings are based on 107 participants aged between 12 to 15 years. There is a lack of research in this age group in rural NL.

Because of the convenient setting of the location, most adolescents in the community in this age category can be accessed. Inclusion criteria to participate in the study were as follows: (a) residents of either Community A or B or attending school in these communities; (b) between the ages of 12 and 16 years; (c) being a student in grade 8 and 9; and (d) had informed but passive consent from parents if under the age of 16; and (e) were willing to take part in the study. There were no exclusion items from participating in the study as no student was meant to feel discriminated against. Data would be collected from students who were pregnant or had a prolonged illness but was not intended to be included in the analysis due to changes in weight that was not a norm. None of the students were excluded because of pregnancy or illness.

Data Collection

Community health nurses in both communities were contacted for assistance in administering the questionnaire and to assist in measuring and recording height and weight of the students. Prior to collecting data we reviewed and agreed upon a standardized method to collect the data. This approach to collect data was chosen first, because of limited class time for a single researcher to collect data and second, the familiarity of students with the community health nurses from previous school health initiatives would provide for a comfortable and trusting partnership. Collaborating with nurses in the community provided a sense of security and validation to school officials, parents, and adolescents regarding the study. The main form of data collection was achieved through the use of self-administered questionnaires with the last page to record

measured height and weight (See Appendix A). Teachers were present to oversee the entire data collection process.

Anthropometric Measurements. Weight measurements were taken using Weight Watchers™ digital scales and heights were taken using a plastic tape measure secured against the wall. The scales and tape measure were tested for accuracy against a dual-purpose medical weight scale and a height stadiometer. Students were weighed with light clothing and without shoes or boots. Measurement for height was under the same conditions. Students were asked to stand straight against the wall, gazing forward, height was measured to the nearest 0.2 cm from the highest point of the student's head. Weight was measured to the nearest 0.1 kg.

Instruments

I used a structured questionnaire that I developed to obtain data to address the research questions (See Appendix A). Surveys are cost effective, economical, provide for a quantitative description of necessary information, convenient for respondents, and provide a rapid turn over in data collection. The format of questions used included multiple choice, frequency tables, Likert scale, and some open-ended questions. My co-supervisors reviewed the questions to ensure face validity.

The questionnaire was designed based on a review of the literature, and in consultation with experts in the Faculty of Nursing and Education and in reference to three surveys conducted in the past by Statistics Canada such as National Longitudinal Study of Children and Youth (Statistics Canada, 2012), Campbell's Survey on Well Being of Canadians (1988), and the Canada Fitness Survey Questionnaire (Canada

Fitness Survey, 1984). A benchmark research paper (that has been referenced several times by other studies) in childhood/adolescent obesity entitled *Secular Trends in the Body Max Index of Canadian Children* (Tremblay & Willms, 2000) had used the data provided in these three surveys to demonstrate the increased body mass index in children over time. It seemed appropriate to use the relevant questions from those three surveys and develop a questionnaire that was used for this study as the questions had already been tested, used, and provided relevant data for analysis.

Following review and approval by the Human Investigation committee (HIC) at Memorial University of Newfoundland, the questionnaire was piloted. Once consent was given from appropriate persons within the Boys and Girls Club, 28 adolescents in the same age group as the target population tested the questionnaire. The questionnaire was piloted for comprehension of the questions and completion time. The pilot suggested that the questionnaire was clear and easy to understand and did not require any modifications. It took approximately 45 minutes to complete.

Data Collection Procedure

Data collection was scheduled a week apart for the two schools. The school officials and community health nurses were sent a package that included the questionnaire, flyers for both students and parents as well as a detailed outline of the data collection method and plan. They were asked to convey any questions regarding the package and study to me at any time. Two weeks prior to data collection, principals were contacted to reconfirm dates that had been agreed upon and to confirm these were times were still convenient.

I met with the school officials and community health nurses the day prior to data collection at the schools. This helped organize the collection of data such as assessing the area for availability of privacy when used for completing questionnaires and taking height and weight measurements. The area used for taking measurements was also set up during that first day. Careful planning is essential when working within the constraints of the classroom schedule (Puskar et al., 1994). By arriving a day before, I was able to meet school officials in person and build a rapport by discussing the study without having any time limitations. All previous communication had been initiated through writing and phone so this was my first opportunity to interact in person with these individuals. The students were also introduced to me during their homeroom time and reminded of the dress code for the study and were given the opportunity to ask questions. Meeting with the students the day before helped with gaining trust from that group as I was not viewed as someone that came in for an hour and left with information.

The day of data collection teachers were present as questionnaires were completed. Scales were calibrated and checked prior to weighing students. Teachers aided in controlling the class from making noise or discussing the questions and collected completed questionnaires prior to measurements. At the next stage, community health nurses greeted and talked to the students while measurements were taken and these measures helped in lowering anxiety levels among the students. This approach to data collection by involving teachers and community health nurses was very efficient as only an hour of the school day was required for the study.

After data were collected, I sent a thank you letter to the school principals, teachers and students and a separate letter to the community health nurses, acknowledging their

hard work and dedication. It is often overlooked, but is vital to the research process, to express thanks to all persons who made the research study possible (Puskar et al, 1994).

Data Analysis

All statistical analysis procedures for this study were conducted using the Statistical Package for Social Sciences (SPSS) version 17.0. I entered the data that was collected via the questionnaire into SPSS. Data cleaning was undertaken to ensure that data entered into the statistical package were correct.

The students' BMI was calculated by taking the body weight (kg) and dividing by height (m) squared = BMI (kg/m2). I used the website *http://www.halls.md/body-mass-index/bmi.htm*, weight in kilograms and height in centimeters, age and gender were entered in appropriate boxes. I used the appropriate charts from the CDC for age and gender to place in percentiles, since in children/adolescents charts for body mass index are represented in percentiles. These charts take into consideration, both age and gender for BMI (Centers for Disease Control and Prevention, 2012a). I also categorized the adolescent's BMI using the CDC classification: normal weight under the 85th percentile; overweight at or above the 85th percentile and lower than the 95th percentile; and obesity at or above the 95th percentile for children of the same age and sex (CDC, 2012a http://www.cdc.gov/obesity/childhood/basics.html). The BMI, which is frequently used to assess body weight, is recognized internationally and determines if an individual's weight is within a healthy range. There is a worldwide consensus on the usefulness of BMI as an indicator of obesity and is established at BMI equal to or greater than 30 in adults and a BMI equal to or greater than the 95th percentile in childhood. Studies that use a variety of measures for obesity may provide inaccurate estimates of the true

prevalence of this problem. Furthermore, lack of employing a worldwide standard measure of adiposity results in prevalence data that are difficult or merely impossible to compare across and within countries.

Most of the data collected were nominal or categorical, e.g., male and female, parent's employment status, or community and as such were analyzed for frequency with some that could be considered ordinal, e.g., Likert scaling for some responses (Polit, 1996). Most of the data were presented as descriptive data and as either percentages or average and standard deviations. To examine the relationship between variables based on gender and by community I used crosstabulation and chi-square test. The latter is appropriate when examining if the relationship between two categorical or interval variables is significant in a crosstabulation (Polit, 1996). Frequencies, crosstabulations and the chi-square test were used for the first three research questions and to determine differences between the two communities among the many variables in the study.

In order to examine some predictors of overweight and obesity among the 107 adolescents I used logistic regression because the dependent variable body weight was categorical, i.e., normal weight versus overweight or obese. This method was selected because the dependent variable normal weight versus overweight or obese using BMI was dichotomous and categorical as were most of the independent variables in the model used to examine some of the predictors of overweight and obesity (0 = Normal weight and 1= overweight or obese). The variables I used in the model for logistic regression were based mainly on findings from the literature on overweight and obesity in adolescents. They were (a) communities as I wanted to examine the differences between the two communities (0= Community A and 1 =Community B); (b) gender in that the literature

consistently has reported that males are more likely than females to be overweight and/or obese (0=male and 1=female); (c) grade level as this would be both an indicator of age and cohort effect (0= grade 8 and 1= grade 9); and (d) had a parent perceived to be overweight or obese as this could serve as the best proxy for the home environment (0 = yes and 1 = no). All variables were entered together. The measurement used for some of the variables and the small sample size limited the number of variables that could be used.

This method was selected because the dependent variable normal weight versus overweight or obese using BMI was dichotomous and categorical as were most of the independent variables in the model used to examine some of the predictors of overweight and obesity (0 = Normal weight and 1= overweight or obese).

The use of this statistical technique allows the researcher to construct a model to help estimate the probability of the occurrence of an event and in this study it was being in the category of overweight or obese (Polit, 1996). The probability of the occurrence of the event of interest is represented by the odds ratio.

Ethical Considerations

This study was submitted to and granted approval by the Human Investigation Committee (HIC) of Memorial University of Newfoundland (See Appendix B). Principals and teachers were fully informed about the study. Written consent was obtained from the director of the school board and verbal consent was obtained from both school principals (See Appendix C). The process of gaining informed consent from parents was discussed with the school principal and arrangements made for a private area needed to take measurements. The teachers were sent a memo through the school office from the principals with details of the study. Without access to the setting, participants

can be restricted, denied or compromised completely, impeding the entire research process. Developing good relationships and rapport (through good communication, openness, honesty, respect, and patience) with the school director, principals, teachers and guidance counselor was imperative because without their support this study would never have been possible.

An invitational flyer was distributed to all eligible students. The flyer introduced the study and purpose, dates for data collection, time it would take to complete the confidential questionnaire, the measurements that would be need to be taken in privacy, and that teachers and nurses would be present to assist. Students were also instructed to wear light clothing, avoiding jeans and bulky clothing such as sweaters in order to prevent false body weights. Information provided that was appropriate to the developmental and emotional level of the adolescent's age and education level allows them to understand the procedure and thus to increase their interest and willingness to participate (Pieranunzi & Frietas, 1992). Students were given the option of not participating in the study even if their parents had given a passive consent. Allowing the adolescents to decide whether or not to participate in the study provided them with choice and showed respect for them and would increase personal autonomy (Pieranunzi & Frietas, 1992). All recruitment materials were submitted to the HIC for ethics approval.

A separate flyer was designed for the parents. A month prior to the scheduled data collection the students brought home this flyer to their parents introducing the researcher, the aim of the study, the way the study was going to be conducted, that there were no benefits of participating, but also no adverse effects to students if they refused to

participate. Parents were asked to phone the school office only if they did not approve or consent that their children be involved in the study. Thus a passive consent was sought as this is thought to decrease selection bias that may occur when parents are asked to provide written consent (Anderman et al., 1995). The issue of whether to use active or passive consent from parents on behalf of minors is one that requires special consideration. Of special consideration is adequate information given to parents regardless of the consent process (Hollerman & McNamara, 1999).

Adolescents/children are considered to be vulnerable research populations and the consent of parents or legal guardian must be obtained (Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans-2, 2012). The flyer sent home clearly stated that if the student or the parent did not consent to take part in the study then there was going to be no negative consequences to the student's healthcare or education. If the parent did not contact the school to withhold permission/consent, the student with consent would be part of the study. This method of obtaining consent was chosen because adolescents have been noted to have lost signed consent forms in previous studies and thus prolonged data collection (Puskar et al., 1994). The option to withdraw from the study at any time by student or parent was also presented. Parents were also given the option of contacting the researcher through phone, email, or regular mail with any questions or concerns during the month prior to or after data collection. It was found that providing information related to the study while seeking consent and including the opportunity for parents to obtain more information was helpful for parents giving research consent (Belzer, McIntyre, Simpson, Officer, & Stadey, 1993).

Questionnaires and measurement sheets did not ask for any identifying information such as names or postal codes. To maintain confidentiality the students were instructed to tear the measurement record sheet (the last page) away from the questionnaire once completed. The questionnaire was submitted and students proceeded to be measured with only the record sheet in hand. Each questionnaire and measurement record sheet had an unique individual code, but not linked to an individual student's name. This was done to link questionnaires and measurement record sheet to the same student for data entry but also to maintain confidentiality. All those involved in the data collection were asked to sign an oath of confidentiality. Completed questionnaires and electronic data have been stored in a locked, secured cabinet and will be maintained for at least five years once the thesis is completed and the findings published.

Strengths and Limitations

There were a number of strengths of this study as well as some limitations. One of the strengths was that actual height and weight were measured using standardized equipment. As noted in the literature review a number of large scale studies that report overweight and obesity use self- or parent-reported weight for the child or adolescent's weight or for estimates of overweight and obesity. At least for parent reported weights this has been found to overestimate the problem of overweight in school-aged children (Banach et al., 2007). A second strength of the study was that the questionnaire was constructed using questions from well-used surveys. As well I tested the actual questionnaire on a group of adolescents in the province that would be similar to the participants in the study. These activities helped to at least help to establish a degree of at

least content validity, i.e., "extent to which the instrument actually reflects the abstract construct being examined" (Burns & Grove, 2001, p. 376).

Some of the limitations that must be considered are the length of the questionnaire. Some of the students may have found it long to complete as a consequence accuracy of response might have suffered. In addition I was asking them to recall food consumption and activity over a period of time and some of this data might not be accurate. It is important to note that there were not much missing data and only one student did not complete the entire questionnaire. A second weakness is the small number of participants and in particular for the predictors of overweight and obesity using logistic regression. The research did have almost the entire populations of both schools for the designated grades in both communities so the findings are of practical importance, however the findings cannot be considered representative of other rural communities. A third weakness is that CDC BMI classification was used to categorize and code the adolescent's weight and this might have underestimated the number of overweight and obese individuals in comparison with the WHO BMI classifications (Mez, Ogden, Flegal, & Grummer-Strawn, 2008). The use of the CDC BMI classification is also a limitation for comparative purposes because WHO BMI classification is presently more widely used.

Chapter 4

Findings

In this chapter I present the findings from my research. The emphasis is on the prevalence of normal weight, overweight, and obesity (please see page 10 for definitions), and the relationship with variables that are thought to be predictors of body weight in adolescents. The findings are presented by community as I was examining the difference in body weights, and in particular factors associated with overweight and obesity, of adolescents in the two communities. I also examined the nutritional and exercise practices of the adolescents in these communities and any differences in perceptions, barriers, and benefits related to nutritional practices and physical activity. Where feasible I have broken down the statistics within communities by gender as in many previous studies on adolescents and overweight and obesity there are a number of gender differences. The final section is an examination of predictors of obesity among this adolescent group.

Characteristics of Students

A total sample size of 107 students from both schools participated in the study with 48 students from Community A and 59 students from Community B completing the study. Some of the characteristics of these participants are presented in Table 1. In Community B, a significantly higher percentage of the students were between the ages of 12-13 years old. In Community A, the age groups had equal numbers. The mean age for Community A was 13.44 years ($SD = 0.681$) and for Community B it was 13.27 Years ($SD = 0.582$). In Community B, a significantly higher percentage of students were in

Grade 8 than in Community A. In Community A, there were a higher percentage of male students and in Community B the percentage was higher for females. There were slight differences in the parent's employment status. A higher percentage of both parents of the students in Community A were employed whereas in Community B a higher percentage of both parents were not working.

Table 1: *Characteristics of Students by Community (N= 107)*

	Community A (n=48)	Community B (n=59)
Age		
12-13 years	24 (50%)	41 (69.5%)[1]
14-15 years	24 (50%)	18 (30.5%)
Grade		
Grade 8	21 (43.8%)	39 (66.1%)[1]
Grade 9	27 (56.2%)	20 (33.9%)
Gender		
Female	20 (41.7%)	26 (44.1%)
Male	28 (58.3%)	33 (55.9%)
Parent's Employment Status		
Father only employed	10 (22.7%)[2]	17 (28.8%)
Mother only employed	5 (11.5%)	5 (8.5%)
Both parents employed	27 (61.4%)	31 (52.5%)
Neither parent employed	2 (4.5%)	6 (10.2%)

[1] Significant difference $p < 0.05$ using Pearson Chi-Square
[2] Note some responses were missing

Weight status

The BMIs of the students ranged from a low of 16.2 to a high of 42.8 with participants falling between the 10th to greater than 99th percentiles. There were ten

students who were in the greater than 99th percentile. The percentiles were used to classify students in either a normal weight, overweight, or in an obese classification (please see page 10 for definitions). Both communities had a high percentage of students who were either overweight or obese. According to the student's BMI for age and gender, some of the main findings were that: Community B had a higher percentage of both overweight and obese students than Community A; females were more likely to be categorized as overweight but males had the higher percentage of obese students; those in grade 9 were more likely to be overweight and obese than in grade 8; and 14 to 15 year old students were more overweight and obese than those in the 12 to 13 year old age group. None of the differences were statistically significant. Table 2 presents findings on weight.

Table 2: *Participants' Weight Classification by Selected Characteristics (N= 107)*

	Healthy Weight	Overweight	Obese
Community			
A (n=48)	22 (45.8%)	11 (22.9%)	15 (31.3%)
B (n=59)	20 (33.9%)	14 (23.7%)	25 (42.4%)
Gender			
Female (n=46)	20 (40%)	13 (25%)	13 (35%)
Male (n=61)	22 (36.1%)	12 (19.6%)	27 (44.3%)
Grade			
8 (n=60)	24 (45.8%)	15 (22.9%)	21 (31.3%)
9 (n=47)	18 (38.3%)	10 (21.3%)	19 (40.4%)
Age group			
12-13 yrs (n=65)	27 (41.5%)	14 (21.5%)	24 (36.9%)
14-15 yrs (n=42)	15 (35.7%)	11 (26.2%)	16 (38.1%)

In the survey I asked the students a number of questions about their weight, such as gain and loss patterns and intent to change weight. I also wanted to know how they perceived their body weight. First, I asked them what they were doing about their weight, e.g., plan to lose or gain weight, stay the same, or not do anything. Second, I asked about actual weight loss over the past year and third I asked about their perception of their weight, i.e., if they considered themselves to be underweight, overweight, or the right weight. Table 3 contains students' behaviours and perceptions of body weight by Community. Although in this age group some weight gain would be expected over the past year and that was reflected in the findings, students in Community A were more likely to have gained greater than 10 lbs. There was a greater percentage of students in Community B who reported their weight had remained the same. The only significant difference found was between males in weight gain and loss.

A higher percentage of females in Community A (70%) felt they were the right weight, however for the remainder of the student groups, the opinions were fairly evenly divided as to perceptions of being overweight or at the right weight. Approximately, 40% of females in Community A and 40% of males in Community B intended to lose weight, while approximately 57% of males in Community A and 54% of females in Community B had stated the same intention. Many of the students intended to stay the same weight. Looking at the perceptions of parental overweight, a higher percentage of males in Community B (45.5%) than the other student groups felt they had an overweight parent.

Table 3: *Behaviours, Intent, and Perceptions of Body Weight by Community*

	Community A (n=48)		Community B (n=59)	
	Female (n=20)	Male (n=28)	Female (n=26)	Male (n=33)
Weight gain/loss[2]				
Gained 1-10 lbs	5 (26.3%)[1]	12 (48%)[1]	13(50%)	13(39.4%)
Gained >10 lbs	6 (31.6%)	5 (20%)	1 (3.8%)	3 (9.1%)
Lost 1-10 lbs	5(26.3%)	5(20%)	3 (11.5%)	6 (8.2%)
Lost > 10 lbs	-- (--)	1 (4%)	-- (--)	1 (3%)
Stayed the same	3 (15.8%)	2 (8%)	9(34.6%)	10 (30.3%)
Weight intent[2]				
Lose weight	8 (40%)	16 (57.1%)	14 (53.8%)	13 (39.4%)
Gain weight	1 (5%)	3 (10.7%)	1 (3.8%)	2 (6.1%)
Stay the same	8 (40%)	5 (17.9%)	11 (42.3%)	17 (51.5%)
Nothing	3 (15%)	4 (14.3%)	-- (--%)	1 (3%)
Weight perception				
Overweight	6 (30%)	12 (42.9%)	15 (57.7%)	15 (45.5%)
Right or Underweight	14 (70%)	16 (57.1%)	11 (42.3%)	18 (54.5%)
Considers a parent overweight				
Yes	5 (25%)	7(26.9%)[1]	8(30.8%)	15(45.5%)
No	15 (75%)	19(73.1%)	18(69.2%)	18(54.5%)

[1]Missing responses
[2] Significant difference $p < 0.05$ Cramér's V for males

What was important in terms of perceptions of weight was to examine students weight gain by weight classification, i.e., overweight or obese. Among the students who fell into the categories of overweight or obese a number reported that in the past year they had gained weight. In both communities those who were classified as overweight or obese were generally trying to lose weight (69.6 % in Community A and 60.5% in

Community A). This finding did not necessarily translate into reported weight loss in that around 35% of those overweight and obese in Community A reported any weight loss, and around 21% in Community B reported the same. In fact these overweight and obese students in both communities were more likely to have reported that they had gained weight. Many, but certainly not all, of the students were generally realistic about their body weight and how they would be classified, however, there were some difference between the two communities. In Community A, 60.9% of the overweight and obese students perceived themselves as such while for Community B this was 57.9%.

Nutritional Practices

Because of the suggested link between nutritional practices and weight a number of questions on a variety of nutritional practices were included in the survey. One of the questions was on the frequency of eating breakfast, lunch, and supper over the past 14 days. Students in both communities were less likely to eat breakfast than any other meal and this had a gender pattern in that females were slightly less likely to eat breakfast than their male counterparts. Supper or the evening meal was the least likely to be omitted of the three daily meals. The means and standard deviations for number of meals eaten during a two-week period are shown by community and by gender for the three daily meals in Table 4. Students' meal consumption frequency did not vary a great deal.

Students who indicated that they frequently skipped breakfast, e.g., more than 5 times per week, were asked why they did not eat this meal. Between 35% (Community A) and 40% (Community B) of students indicated that it was because they did not feel hungry and between 10% (Community A) and 20% (Community B) said they did not have enough time to eat breakfast. Females in both communities were more likely to say

the reason for skipping breakfast on a frequent basis was that they did not feel hungry. There were no statistical differences in any of these responses.

Table 4: *Mean Meal Consumption over a Two Week Period of Students by Gender and Community (N= 107)*

	Community A[1] (n=48) average (*SD*)	Community B (n=59) average (*SD*)
Average Breakfast Consumption past 14 days		
Female	7.45 (5.05)	7.48 (4.12)
Male	9.75 (4.37)	8.91 (4.17)
Average Lunch Consumption past 14 days		
Female	12.75 (2.29)	11.88 (2.83)
Male	12.32 (3.10)	11.67 (2.47)
Average Supper Consumption past 14 days		
Female	13.40 (1.79)	12.58 (2.59)
Male	12.96 (2.66)	12.82 (2.01)

For the breakfast meal, I also asked the students who reported they ate breakfast what foods groupings they were likely to eat for breakfast. Cereals or bread accounted for the highest food consumption in that over 90% of the students in Community A and over 60% in Community B indicated these were what they ate. Males in both communities were more likely to eat meat products or eggs (72% of males in Community A and 58% in Community B) than their female counterparts. Around 60% of all student groups consumed juice and fruits and 55% reported milk or milk product consumption. Tea and coffee consumption had the most variation for Community A in that 14% of

females and 40% of males reported drinking these beverages. In Community B there was little difference for the males and females with around one-quarter of the students reporting they drank tea or coffee.

Major Food Group Consumption

One of the nutritional practices that I investigated was the consumption of food items in the major food groups as defined by Canada's Food Guide, such as grain products, vegetables and fruit, milk products, and meat and alternatives. In addition to these major groupings I asked about coffee and tea consumption. In the survey I listed a number of foods in each of these groups and asked the participants to report frequency of consumption over the last two weeks. For statistical purposes I collapsed the food into the major food groups as presented in table 5 and looked at whether or not they had consumed food in these groups or not over the past two weeks. Vegetable and fruit consumption was of particular interest because a number of studies have shown that lower frequency of consumption in this food group is linked to increased overweight and also it is frequently below what is recommended for this age group. Over half of both males and females in both communities had some vegetable and fruit consumption, however this consumption was far from what is recommended. Food items in the grain products category had the highest consumption particularly in Community A.

Milk products consumption was low for students in both communities. It was lowest in females in Community B and males in Community A. Males in Community A reported the highest consumption of milk products. In contrast females in Community A had the highest consumption of coffee and tea and males in that community had the lowest consumption of these products of all four participant groups.

Table 5: *Consumption in Food Groups by Gender by Community (N= 107)*

	Community A (n=48)		Community B (n=59)	
In the last 2 weeks, have you eaten?	Yes	No	Yes	No
Grain products?				
Female	9 (95%)	1 (5%)	16 (61.5%)	10 (38.5%)
Male	26 (92.9%)	2 (7.1%)	21 (63.6%)	12 (36.4%)
Vegetables & fruit?				
Female	13 (65%)	7 (35%)	14 (53.8%)	12 (46.2%)
Male	15 (53.6%)	13 (36.4%)	20 (63.6%)	13 (39.4%)
Milk products?				
Female	11 (55%)	9 (45%)	12 (46.2%)	14 (53.8%)
Male	16 (57.1%)	12 (42.9%)	18 (54.5%)	15 (45.5%)
Meat and Alternatives?				
Female	9 (45%)	11 (55%)	11 (42.3%)	15 (57.7%)
Male	20 (71.4%)	8 (28.6%)	19 (57.6%)	14 (42.4%)
Tea & Coffee?				
Female	8 (40%)	12 (60%)	7 (26.9%)	19 (73.1%)
Male	4 (14.3%)	24 (85.7%)	9 (27.3%)	24 (72.7%)

In addition to food consumption patterns of these major food groups and caffeine consumption I asked the students how much sweet foods and candies, fats and fried foods, and salt and salty foods they ate in the past year as compared to the previous year. While there were no significant differences a number of the participants said they had

decreased consumption of these types of foods in the past year. Salt and salty food consumption had around a 42% decrease for all the age and gender groups except for boys in Community B where just 27.3 % said they had decreased foods in this category. All age and gender groups reported that they had increased the frequency of eating foods in these groups with the boys in Community B reporting the highest increase for fats (33.3%) and salt (21%) and girls in Community B reporting the highest increase for sweets (36.8%). Girls in Community A were more likely to have decreased consumption of sweet foods and candies with 55% of this group saying that they had decreased to amount. Consumption of fats and fried foods stayed the same for over half the boys in Community A and the girls in Community B, however all age and gender groups in both communities had about a one-third decrease in consumption of these foods.

The students were also asked whether or not they ate fast foods and if so on average how many times they had eaten fast foods in the last two weeks. Fast food consumption was quite high in that over 95% of girls and boys in Community A had eaten fast foods and 80% or more of those in Community B had done so as well. Table 6 shows the fast food consumption by gender and community.

In addition to consumption of food in the major food groups, coffee and tea intake and fast food consumption I asked students for preferences of selected foods. In Table 7 these findings are presented by community and gender. While there were some community and gender differences, there were no statistical differences in the ratings. Females in Community B were the most likely to say they could take or leave this type of food but preference rating was still quite high at 73.1%.

Table 6: *Fast Food Consumption by Gender and Community (N=107)*

	Community A (n=48)		Community B (n=59)	
Do you eat fast foods?				
	Yes	No	Yes	No
Female	19 (95%)	1 (5%)	21 (80.8%)	5 (19.2%)
Male[1]	26 (96.3%)	1 (3.7%)	27 (81.8%)	6 (18.2%)
Average Fast Food Consumption past 14 days - Average (SD):				
Female	12.75 (2.29)		11.88 (2.83)	
Male	12.32 (3.10)		11.67 (2.47)	

[1]Response missing for Community A

Food consumption and food preferences were congruent. Generally preference for bread and snack foods also rated higher than fish or meats. All of the participants rated their preference for vegetables as low, which is in keeping with food consumption patterns noted above in Table 5.

Table 7: *Food Preferences by Gender and Community (N=107)*

	Community A (n=48)		Community B (n=59)	
What is your preference for:	Female (n=20)	Male (n=28)	Female (n=26)	Male (n=33)
Cookies/cakes/sweets?				
Dislike	-- (0%)	1 (3.7%)[1]	5(19.2%)	1(3.0%)
Take/leave it	6(30.0%)	4 (14.8%)	6(23.1%)	13(39.4%)
Like	14(70.0%)	22(81.5%)	15(57.7%)	19 (57.6%)
Bread/pasta/cereal?				
Dislike	1 (5.0%)	3(11.1%)[1]	1(3.8%)	1(3.0%)
Take/leave it	3(15.0%)	9 (33.3%)	6(23.1%)	7(21.2%)
Like	16(80.0%)	15(55.6%)	19(73.1%)	25(75.8%)
Fast foods/restaurant?				
Dislike	-- (0%)	1(3.8%)	--(0%)	1(3.0%)
Take/leave it	3(15.0%)	6 (18.2%)	7(26.9%)	6(18.2%)
Like	17(85.0%)	21(80.8%)	19(73.1%)	26(78.8%)
Fish?				
Dislike	8(40.0%)	6(18.2%)	12(46.1%)	9(27.3%)
Take/leave it	4(20.0%)	8(29.6%)	8(30.8%)	9(27.3%)
Like	8(40.0%)	13(48.1%)	6(23.1%)	15(45.5%)
Vegetables?				
Dislike	3(15.0%)	5(18.5%)[1]	7(26.9%)	14(42.4%)
Take/leave it	5(25.0%)	10(37.0%)	9(34.6%)	9(27.3%)
Like	12(60.0%)	12(44.4%)	10(38.4%)	10(30.3%)
Milk/cheese/yogurt?				
Dislike	--(0%)[1]	--(0%)[1]	--(0%)	2(6.1%)
Take/leave it	6(31.6%)	8(29.6%)	5(19.2%)	8(24.2%)
Like	13(68.4%)	19(70.3%)	21(80.8%)	23(69.7%)

Beef/Pork?				
Dislike	6(30.0%)[1]	4(20.0%)[1]	9(34.6%)	6(18.2%)
Take/leave it	4(20.0%)	6(30.0%)	6(23.1%)	9(27.3%)
Like	9(47.4%)	17(62.9%)	11(42.3%)	18(54.6%)
Snack foods?				
Dislike	-- (0%)	--(0%)[1]	1(3.8%)	3(9.1%)
Take/leave it	1(5.0%)	7 (25.9%)	7(26.9%)	5(15.2%)
Like	19(95.0%)	20(74.1%)	18(69.2%)	25(75.8%)
Chocolate/chips?				
Dislike	1(5.0%)	2(7.4%)[1]	1(3.8%)	1(3.0%)
Take/leave it	5(25.0%)	8 (29.6%)	6(23.1%)	12(36.4%)
Like	14(70.0%)	17(63.0%)	19(73.1%)	20(60.6%)

[1] Missing response

The final areas examined about food were on the students' eating habits and in particular how healthy they felt their eating habits were. They were also asked when they tended to eat food when not hungry. The findings are presented in Table 8. Three-quarters or more of both male and female participants rated their eating habits as healthy. However, the participants in Community B were more likely to say their eating habits were unhealthy. As to when the students said they ate the most when not hungry in Community A for both females (52.6%) and males (67.9%) it was when they were bored. Males in Community B said they ate more when not hungry when they were stressed (39.4%) and for the females it was distributed equally among being stressed, being sad, and being angry (23.1%). The findings were significantly different between the males in the communities but not the females. Other questions of food and food consumption were on healthy choices at home and school and some questions on food security. Over 80% of the students in community A and both females and males felt this was so, while only around 58% in Community B rated their food choices as healthy. In terms of food

security, a very small number said they were worried there would not be enough to eat because of money or they did not eat the quality or variety of food they wanted because of money and this varied from 7.1% - 10.0% in Community A and 15.2% -19.2% in Community B. What might be more telling was slightly more students did not respond to this question.

Table 8: *Rating of Eating Habits by Gender and Community (N=107)*

	Community A (n=48)		Community B (n=59)	
	Female (n=20)	Male (n=28)	Female (n=26)	Male (n=33)
How do you feel about your eating habits?				
Healthy	16(80.0%)	24 (85.7%)	20(76.9%)	26(78.8%)
Unhealthy	4(20.0%)	4 (14.3%)	6(23.1%)	7(21.2%)
Eat the most when not hungry?				
Stressed, anxious, etc	5(26.3%)[3]	2(7.1%)	6(23.1%)	13(39.4%)[1]
When sad	1(5.3%)	1(3.6%)	6(23.1%)	5(15.2%)
When angry	--	--	6(23.1%)	4(12.2%)
Bored or lonely	10(52.6%)	19(67.9%)	5(19.2%)	7(21.2%)
Other[2]	2(10.5%)	4(14.3%)	1 (3.8%)	3(9.1%)
Never	1(5.3%)	2(7.1%)	2(7.7%)	1(3.0%)

[1]Significant difference between the males in Community A and B Pearson Chi Square 0.001 but not the females.
[2]Not specified what the other included.
[3]One response missing.

Physical Activity

As had been suggested in the literature on overweight and obesity, another modifiable factor that contributes to overweight and obesity is decreased physical activity or lack of exercise. A large section of my questionnaire asked students about their physical activity. One of the questions I asked the participants was on an average school day and weekend how many hours were spent using a computer, playing video games, or watching television. This is a typical way of measuring inactivity. While students in both communities spent on average greater time on the computer, playing video games, or watching television on the weekend, the time in inactivity was higher in both females and males in Community A than Community B. Some of the computer related time spent on weekdays could of course be related to school work but it was not clear how much this was the case. In future surveys it would be important to sort out required versus recreational use of the computer. The average times spent in inactivity is presented in Table 9.

The students were also asked about their activities they took part in over a four week period. They were presented with a comprehensive list of activities and asked to report over the last four weeks if they had participated in an activity that "lasted for 20 minutes and made you breathe hard, sweat, and increased your heart rate?" The range in the number of activities they took part in varied between 0 to 91 activities. Table 10 is a summary of activities.

Table 9: *Time Spent in Inactivity (Computer, Video Games, and Watching Television) by Community and Gender (N=107)*

	Community A		Community B	
	Females (n=20)	Males[1] (n=28)	Females (n=26)	Males (n=33)
Average time per school day				
No time	1 (5.0%)	1(3.6%)	5 (19.2%)	6 (18.2%)
< 1 hour	3 (15.0%)	2 (7.1%)	8 (30.8%)	6(18.2%)
1-3 hours	10 (50.0%)	17 (60.7%)	11 (42.3%)	19 (57.5%)
4 or more hours	6 (30.0%)	7 (25.0%)	2 (7.6%)	2 (6.0%)
Average time per weekend*				
No time	2 (10.0%)	--	3 (11.5%)	3 (9.1%)
< 1 hour	2 (10.0%)	1 (3.6%)	4 (15.4%)	7(21.2%)
1-3 hours	6 (30.0%)	11(39.2%)	16 (61.6%)	18 (54.6%)
4 or more hours	10 (50.0%)	15 (53.6%)	3 (11.5%)	5(13.7%)

[1]One response missing

The males in Community B were the least likely of the four comparison groups to take part in the physical activities whereas the males in Community A had slightly higher average participation in activities followed closely by the females in Community A and Community B. In terms of average hours spent in these various activities the males in Community A had the highest participation time in physical activities of the four groups.

Table 10: *Mean and Standard Deviation of Number of Activities and Time Spent in Activities in Past Four Weeks by Community and Gender (N=107)*

	Community A		Community B	
	Females (n=20)	Males (n=28)	Females (n=26)	Males (n=33)
Average number of activities				
Mean	12.75	12.86	11.38	9.76
SD	9.54	13.05	18.01	7.56
Average time spent in activities				
Mean (hours)	7.7	13.8	5.5	5.4
SD	7.2	20.3	7.3	4.1

Attitudes Towards Vigorous Activity

An individual's attitude towards activity is one factor that may partially determine whether or not the individual would take part in any physical activity and especially more intense exercise. To measure the students' attitudes I asked students to rate six common attitudes towards participating in vigorous activity. I used a Likert scale for measurement and polar opposite words to measure the attitude, e.g., "boring versus fun" and "difficult versus easy." The findings are in Table 11.

Most of the students had what could be considered positive or at least neutral attitudes towards vigorous exercise with a few exceptions. At least 73% of the students and more felt it was fun and very few rated it as boring.

Table 11: *Attitudes Towards Vigorous Activity by Community and Gender (N=107)*

	Community A (n=48)		Community B (n=59)	
Vigorous activity is?				
	Female (n=20)[1]	Male (n=28)[1]	Female (n=26)	Male (n=33)[1]
Boring	1(5.00%)	1 (4.0%)	2(7.7%)	--(0%)
Neutral	4(20.0%)	4 (16.0%)	5(19.2%)	6(18.8%)
Fun	15(75.0%)	20(80.0%)	19(73.1%)	19 (81.2%)
Harmful	1 (5.3%)	6(23.1%)*	3(11.5%)	1(3.1%)
Neutral	5(26.3%)	0 (-- %)	8(30.8%)	10(31.3%)
Beneficial	13(68.4%)	20(76.9%)	15(57.7%)	21(65.6%)
Unpleasant	5(26.3%)	3(12.5%)**	8(30.8%)	9(28.1%)
Neutral	2(10.5%)	1 (4.2%)	4(15.4%)	11(34.4%)
Pleasant	12(63.2%)	20(83.3%)	14(53.8%)	12(37.5%)**
Inconvenient	3(15.8%)	5(20.8%)	9(34.6%)	6(18.8%)
Neutral	7(36.8%)	3(12.5%)	6(23.1%)	9(28.1%)
Convenient	9(47.4%)	16(66.7%)	11(42.3%)	17(53.1%)
Painful	3(15.8%)	4(16.0%)	6(23.1%)	8(25%)
Neutral	4(21.1%)	4(16.0%)	6(23.1%)	10(31.3%)
Not painful	17(68.0%)	14(53.8%)	14(43.8%)	12(63.2%)
Difficult	1(5.3%)	5(19.2%)	5(19.2%)	4(12.5%)
Neutral	7(36.8%)	4(15.4%)	8(30.8%)	9(28.1%)
Easy	11(57.9%)	17(65.4%)	13(50.0%)	19(59.4%)

* Using Cramér's V significant $p<0.001$ **Using Cramér's V significant $p<0.002$

[1] Some missing responses.

Likewise the majority of respondents felt that this level of activity was beneficial, however almost a quarter of the males in Community A rated it as harmful. This was a significant difference. Likewise there were significant differences in the rating of how pleasant vigorous activity was with 83. 3% of males in Community A rating exercise as pleasant or very pleasant and other gender groups in both communities less likely to do so.

Students were also asked if they could easily participate in physical activity three or more times per week for twenty minutes. Students in Community A were more likely to agree they could engage in this level of participation with 75% of the males in that community saying they could and 73.7% of the females agreeing this was possible. None of the students disagreed with the statement and around one-quarter were undecided if they agreed or disagreed this was possible. Males in Community B were much less likely to think this possible as only 59.4% said they agreed, 34.4% were undecided and 6.2% disagreed. The findings for the females in Community B were only slightly more promising for agreeing it was possible in that 69.2% agreed, however 15.4% neither agree or disagreed and the same percentage did not think this was a possibility.

Barriers to Participation in Exercise

There can be a number of reasons why an adolescent may or may not take part in exercise. I used a number of common barriers to participation and asked each of the participants how important that factor was in preventing them to be more physically active. Table 12 is a summary of the importance of these factors.

Table 12: *Barriers to Exercising by Gender and Community (N=107)*

	Community A (n=48)		Community B (n=59)	
How important is each of the following as a barrier to physical activity?[1]	Female (n=20)	Male (n=28)	Female (n=26)	Male (n=33)
Lack of time (work/school)?				
Not important	10 (50.0%)	10 (37.0%)	11 (42.3%)	8 (24.2%)
Important	6 (30.0%)	10 (37.0%)	8 (30.8%)	13 (39.4%)
Very important	4 (20.0%)	7 (25.6%)	6 (23.1%)	11 (33.3%)
Lack of time (chores/responsibilities)?				
Not important	14 (70.0%)	20 (74.1%)	18 (69.2%)	20 (76.9%)
Important	4 (20.0%)	5 (18.5%)	6 (23.1%)	8 (24.2%)
Very important	2 (10.0.%)	2 (7.4%)	2 (7.7%)	4 (12.1%)
Lack of time (other interests/hobbies)?				
Not important	12 (60.0%)[1]	20 (70.0%)	11 (42.3%)	14 (42.4%)
Important	2 (10.0%)	5 (25.6%)	11 (42.3%)	12 (36.4%)
Very important	4 (20.0%)	3 (25.6%)	4 (15.4%)	6 (18.2%)
Lack of energy/too tired?				
Not important	13 (65.0%)[1]	17 (62.9%)	4 (15.4%)	12 (36.4%)
Important	3 (15.0%)	6 (22.2%)	8 (30.8%)	9 (27.3%)
Very important	2 (10.0%)	5 (18.5%)	14 (53.8%)	11 (33.3%)
Lack of athletic ability?				
Not important	13 (65.0%)[1]	17 (62.9%)	8 (30.8%)	8 (24.2%)
Important	3 (15.0%)	4 (14.8%)	8 (30.8%)	10 (30.3%)
Very important	3 (15.0%)	7 (25.6%)	10 (38.5%)	14 (42.4%)
Lack of programs/leaders?				
Not important	19 (95.0%)[1]	16 (59.2%)	12 (46.2%)	13 (39.4%)
Important	0 (--%)	5 (18.5%)	7 (26.9%)	15 (45.5%)
Very important	0 (--%)	7 (25.6%)	7 (26.9%)	4 (12.1%)
Lack of someone to work out with?				
Not important	13 (65.0%)	15 (55.5%)	12 (46.2%)	11 (33.3%)
Important	3 (15.0%)	7 (25.9%)	6 (23.1%)	13 (39.4%)
Very important	4 (20.0%)	6 (22.2%)	8 (30.8%)	8 (24.2%)

Lack of support (families/friends)?				
Not important	13(65.0%)	16 (59.2%)	13 (50.0%)	15 (45.5%)
Important	2 (10.0%)	8 (29.6%)	6 (23.1%)	7 (21.2%)
Very important	4 (20.0%)	4 (14.8%)	7 (26.9%)	9 (27.3%)
Too expensive?				
Not important	15 (%)	21 (77.8%)	6 (23.1%)	7 (21.2%)
Important	0 (--%)	2 (7.4%)	9 (34.6%)	13 (39.4%)
Very important	4 (20.0%)	4 (14.8%)	11 (42.3%)	12 (36.4%)
Lack of self -discipline?				
Not important	16 (80.0%)	17 (62.9%)	12 (46.2%)	12 (36.4%)
Important	1 (5.0%)	3 (11.1%)	5 (19.2%)	12 (36.4%)
Very important	2 (10.0%)	7 (25.9%)	9 (34.6%)	8 (24.2%)
Self-conscious?				
Not important	9 (45.0%)	17 (62.9%)	15 (57.7%)	19 (57.6%)
Important	4 (20.0%)	5 (18.5%)	2 (7.7%)	8 (24.2%)
Very important	6 (30.0%)	5 (18.5%)	9 (34.6%)	5 (15.2%)
Long term illness/disability/injury?				
Not important	13 (65.0%)	18 (66.7%)	19 (73.1%)	24 (72.7%)
Important	1 (5.0%)	4 (14.8%)	4 (15.4%)	4 (12.1%)
Very important	5 (25.0%)	6 (22.2%)	3 (11.5%)	4 (12.1%)
Fear of being injured or hurt?				
Not important	13 (65.0%)	20 (74.1%)	17 (65.4%)	22 (66.6%)
Important	3 (15.0%)	4 (14.8%)	5 (19.2%)	3 (9.1%)
Very important	2 (10.0%)	4 (14.8%)	4 (15.4%)	7 (21.2%)
Not important /beneficial?				
Not important	15 (75.0%)	17 (62.9%)	6 (23.1%)	10 (30.3%)
Important	2 (10.0%)	7 (25.9%)	6 (23.1%)	10 (30.3%)
Very important	2 (10.0%)	4 (14.8%)	14 (53.3%)	12 (36.4%)
Poor weather?				
Not important	15 (75.0%)	10 (37.0%)	7 (26.9%)	9 (27.3%)
Important	2 (10.0%)	10 (37.0%)	4 (15.4%)	8 (24.2%)
Very important	2 (10.0%)	8 (29.6%)	15 (57.7%)	15 (45.5%)

[1] A number of categories have one to two responses missing

The adolescents identified a number of barriers that they felt prevented them from taking part in exercise and these varied somewhat. For the females in Community A the two most frequently reported barriers were self consciousness or not being comfortable with self (30.0%) and long term illness/disability or injury (25.0%), while for the females in Community B the main barriers were poor weather (57.7%) and lack of self discipline or will power (53.8%). Males in Community A reported poor weather (29.6%) and lack of self discipline or will power as the main barriers, while their counterparts in Community B rated poor weather as the main barrier (45.0%) and a lack of athletic abilities (42.4) as the second top barrier. While there were a number of differences in the responses between the students in the two communities, none of these differences were statistically significant.

Predictors of Overweight and Obesity

Predictors of overweight and obesity were examined using logistic regression as described in the methods section. Logistic regression was chosen because the use of this method of statistical analysis allows for a comparison of "observed values of the response variable to predict values obtained from models with or without the variable in question" (Hosmer & Lemeshow, 1989, p. 13). In this analysis I selected variables thought to be important to predictors of adolescent overweight and obesity to construct a model to test using logistic regression. These findings must be interpreted with caution because of the small number of participants. Although none of the variables were significant at the 0.05 level (Wald chi-square statistic) with 95% confidence level for the Exp(B) or odds ratio, the findings suggest that those who were male were 1.307 times more likely to be overweight or obese than those who were female. Similarly those who reported they had a

parent who was overweight were were 1.059 times more likely to be overweight than those who did not report they had an overweight parent. Table 13 is the logistic regression predicting the likelihood of overweight and obesity using these variables.

Table 13: *Logistic Regression Estimates Predicting the Likelihood of Overweight and Obesity Based on Selected Variables (N- 107)*

Predictor Variable	B	Wald	Sig.	Exp(B)
Gender [male]	.268	0.431	.511	1.307
Community [A]	-.655	2.370	.124	0.519
Grade [8]	-.301	0.504	.478	0.740
Parent Overweight	.057	0.017	.896	1.059
Constant	.701	2.215	.145	2.015

Chapter 5

Discussion

The purposes of this study were threefold: first, to explore and report the prevalence of overweight and obesity of adolescents in two rural communities in NL; second, to determine if there were differences in dietary practices, such as food consumption, concerns about body weight, and perceptions, barriers, and benefits related to physical activity in the communities and third, to determine if there were any predictors associated with overweight or obesity among these adolescents. To do this I selected two communities in rural Avalon that differed by socioeconomic characteristics, and surveyed 107 adolescents in two schools for the comparisons. Actual height and body weight were used to determine the appropriate BMIs for gender and age of these adolescents and based on this to classify them as either underweight, normal weight, overweight, or obese. I developed a questionnaire that examined adolescent practices, perceptions and attitudes surrounding dietary habits and physical activity. This chapter will present a discussion of the major findings of this study and offer possible explanations for the observed findings. Where possible, links are made with the findings of this study and other published research studies related to adolescent obesity. As a guide to investigating these important questions I adapted a conceptual model based on the influence of the social determinants of health on adolescent overweight and obesity (See Figure 1) and I conducted a review of selected literature on these determinants. While many of these determinants are at a population level and my data collected were at the individual level, in as far as it was

possible I did have questions in my survey that addressed some of these determinants and these will be addressed in the discussion.

Prevalence of Weight Distributions

My first research question was is there any difference in the prevalence of underweight, normal weight, overweight, and obesity between the two selected rural communities? The differences in body weight among the adolescents between both communities were not statistically significant, however, some differences did exist. Males were more likely to be obese than females. Females were slightly more likely to be overweight or normal weight than males. There were no reported underweight males or females in the sample size. Community B had an overall higher percentage of overweight and obese adolescents, while Community A presented with a slightly higher percentage of healthy weight adolescents suggesting perhaps the difference in socioeconomic status in the communities could make a difference. The overall socioeconomic conditions were better in Community A than Community B. The obesity rates were much higher for both the adolescents in my study when compared to national and provincial averages. In 2004, children between the ages of 2-17 years of age were found to be 19 % overweight and 16.6% obese using BMIs, thus ranking NL as having the heaviest weights in Canada with a combined overweight and obesity rate of 35.6%. In the same year, 20% of adolescents between the ages of 12-17 years were overweight and 9% percent were obese with a combined overweight and obesity rate of 29% across Canada (Alberta Health Services, 2010).

The findings of this study are consistent with the national trend of males tending to be more obese when compared to females (Ball et al., 2001; Bernard et al., 1995).

Between 2007-2009, across Canada 29.3% of males and 26.3% of females between the ages of 12-17 years old were either overweight or obese (Alberta Health Services, 2010). This study found a higher percentage of males being in the overweight and obese category when compared to females. It is crucial to note that the obesity rate in my study is almost double that of males and females when compared to the rest of Canada. The overweight and obesity rate for these two communities combined is 57%, which is almost double that of the entire province (Twells, 2005). Another interesting finding was that those in the 12-13 year old age group were slightly more obese but also had a higher percentage of normal weight adolescents when compared to the14-15 age group. The 14-15 year olds were more likely to be overweight than the 12-13 years old in both communities combined.

A possible explanation for overall higher obesity rates could be linked to the homogenous population sampled in both rural communities compared to a more culturally and ethnically diverse population across Canada. According to Twells and Newhook (2011), an accurate measure of overweight and obesity is crucial in defining its burden. The authors calculated BMI of 1026 preschool children using measured weights and heights and compared the prevalence of overweight and obesity based on three sets of growth references to assess a child's weight status. The three sets of growth charts used with BMI cut-points were published by the CDC, WHO and International Obesity Task Force (IOTF). The CDC growth chart reported a higher prevalence of obesity and therefore, the authors concluded that prevalence of childhood obesity is dependent on growth charts used making findings inconsistent and difficult to compare between studies (Twells & Newhook, 2011). In the current study the CDC growth chart were used to

define overweight and obesity therefore, reporting a higher prevalence of overweight and obesity. Nevertheless, the prevalence of overweight and obesity in both communities is alarming and requires further investigation. There is no research available on the prevalence of overweight and obesity among adolescent males and females in specific rural and urban areas in NL to make any further comparisons. However, the findings in this study might provide baseline data and knowledge that might lead to future studies in other communities within the province. Without further research it is difficult to understand the magnitude of the prevalence of overweight and obesity and develop effective preventative and interventional strategies for adolescents. As Sweeting (2008) suggested in her review of the "gendered dimensions" of obesity in youth, we need to interpret findings from a study that does find gender differences with caution because of the multidimensional factors involved in obesity. Each of these factors may have gendered effects and not always in the same direction.

Weight gain in the affected individuals had mainly occurred within the past year of the survey according to the adolescents' self-reports on this variable. This finding would support the suggestion that alterations in total percentage of body fat and patterns of fat distribution change due to puberty and hormonal change during adolescence possibly making them more vulnerable to weight gain (Daniels et al., 2005), and this is indeed a critical period for weight gain prevention (Lloyd-Richardson, Bailey, Fava, & Wing, 2009). Aside from physical changes, adolescents transition socially and cognitively and gain more independence and greater freedom in decision making, especially in regards to health behaviors (Bodenlos, Rosal, Blake, Lemay, & Elfenbein, 2010).

Weight Perceptions Versus Actual Weight

Most of the adolescents surveyed were realistic about their weight. These findings provide insight into the fact that the overweight and obese adolescents, for the most part, have an accurate perception of their weight and did say they intended to lose weight, even though there has been no significant weight loss reported. However, not everyone had an accurate perception of what her/his weight was. A substantial percentage of those classified as overweight or obese viewed themselves as being either a healthy weight or even underweight. This observation is supported by other researchers who had similar findings in that a high percentage of overweight and obese students do not view themselves as overweight or obese (Brener, Eaton, Lowry, & McManus. 2004; Rahman and Berenson, 2010; Standley, Sullivan, & Wardle, 2009). Edwards, Pettingell, and Borowsky (2010), found that from 1999 through 2007 between 29% and 33% of youth in a national American survey misperceived their weight and did not consider themselves overweight. Youth that are overweight and obese are more likely to misperceive their weight when compared with their normal weight peers (Maximova et al., 2008). In accurate assessment of weight is not an uncommon phenomena (Kuchler & Variyam, 2003; Edwards et al., 2010). It is a concern in that it can be manifested through unhealthy weight-related behaviours (Rahman & Berenson, 2010).

It is also concerning that many overweight and obese adolescents did not realize that they have a weight issue and thus may explain why some overweight or obese adolescents misperceived their weight and therefore want to maintain their present weight status. Weight misperception can be a determining factor of healthy and unhealthy behaviours and choices. Accurate perception of body weight is important to be successful

in obesity prevention programs. Therefore, this would indicate that adolescents require education in determining what their healthy weight is. Behavioural intervention programs are not successful unless an individual recognizes that they are overweight or obese (Rahman & Berenson, 2010).

The finding that a high percentage of adolescents who were overweight and obese in both communities were aware of their weight status and attempting to lose weight indicates suggests perception of being overweight and obese is associated with intention to lose weight and this has been noted in other studies (Rahman & Berenson, 2010; Yost, Krainovich-Miller, Budin, & Norman, 2010). The finding that there was no significant weight loss reported, assuming adolescents are engaging in weight-loss behaviours, indicates that these methods might not be effective in maintaining or losing weight is consistent with another study (Fagan, Diamond, Myers, & Gill, 2008).

If the adolescents' perceptions of overweight in parents were accurate, a number of families are perhaps affected. This may indicate that adolescents may either be predisposed to obesity genetically (WHO, 2000) or that adolescents are following and learning poor health behaviours from their parents, such as, poor dietary intake and decreased of physical activity. Parents influence their children as role models and also prepare and provide most meals. If parents and adolescents consume similar diets than it would make sense that prevalence of overweight would be similar. Overweight in the family could also account for the misperception by adolescents of their weight as explained by Canadian researchers, Maximova and others (2008), in that overweight or obese adolescents may not view themselves as such when surrounded by parents or friends that are of similar or larger stature.

Determinants of Overweight and Obesity

The second research question was how do selected determinants of overweight and obesity, e.g. dietary practices and physical activity, differ in the two communities? These two areas are usually classified under personal health practices/coping in the determinants of health.

Dietary Practices

A good indicator of a healthy adolescent lifestyle is associated with regular breakfast consumption (Rampersaud, Pereira, Girard, Adams, & Metzi, 2005). Adolescents who have regular breakfast have also reported to be more physically active (Keski-Rahkomen, Kaprio, Rissanen, Virkkunen, & Rose, 2003). In addition, to being an indicator for a healthier lifestyle eating regular breakfast has been associated with lower risks of overweight and obesity amongst adolescents (Szajewska & Ruszczynski, 2010). The adolescents in the present study did not have appropriate breakfast consumption habits. These findings are similar to another Canadian study that found that by Grade 8, 47% of girls and 33% of boys did not eat breakfast daily (Evers, Taylor, Manske, & Midgett, 2001). Similarly, poor breakfast consumption by adolescents in the study were also supported by European studies where females were less likely than males to consume breakfast and overall breakfast habits were inappropriate (Lien, 2007; Keski-Rahkonen et al., 2003; Sjoberg, Hallberg, Hoglund, & Hulthen, 2003). A possible reason for the difference found with breakfast consumption between males and females could be that girls skip breakfast in the hopes of weight control (Latimore & Halford, 2003).

The main reasons for skipping breakfast reported in this study were not feeling hungry in the morning and not having enough time to eat breakfast. The latter could be

interpreted as adolescents staying in bed to get some extra sleep and only being left with sufficient time to dress for and travel to school. It would appear that skipping breakfast is a personal choice and that of convenience rather than dieting. These reasons for skipping breakfast are noted by Bidgood and Cameron (1992) and Shaw (1998). Similarly, a much earlier study conducted by Singleton and Rhoads (1982) found that skipping breakfast was greatly associated with not having time (43%) and not feeling hungry (42%) rather than dieting, not liking the food, no one to prepare breakfast or lack of availability of foods.

Lunch and dinner consumption also varied. Possible reasons for missing lunch and supper meals could be related to frequent snacking and, therefore, a lack of hunger, or to the bigger issue food security, and not having and adequate supply of food. While the latter was difficult to assess from the survey results, some indicated there was not enough money for food in the household. Food insecurity is often compensated for through coping strategies used by parents, such as protecting the children in the family or modifying their own food consumption (Adekoya, 2009). Lack of meals at home, such as lunch and supper, could also be masked because older children may be able to supplement their meals at school, friends, or neighbors' homes. It is also important to look at the variety of foods consumed. A lack of consuming a variety of foods and the possible consumption of cheaper more energy dense foods may be the cause of the slightly higher prevalence of overweight and obesity noted between the communities. The complexity of this is supported by a review of multiple studies exploring relations of food security and overweight and obesity by Eisenmann, Gundersen, Lohman, Garasky, and Stewart (2011), who found mixed results of positive, negative and null associations. They

concluded that a few current larger sample studies found no relation between food security and obesity; nonetheless, all studies show that food insecurity co-exists with overweight and obesity, despite no significant statistical difference between overweight in food secure and overweight in food insecure homes; overweight remains relatively higher in food insecure children.

According to Canada's Food Guide (Health Canada, 2007), adolescents between the ages of 14 to 18 years of age should be consuming 7-8 servings of vegetables, 6-7 servings of grain products, 2-3 servings of meat and alternatives, for females and males respectively and 3-4 servings of milk and alternatives for both genders. To compare daily servings of major food groups as described by Canada's Food guide to that of the adolescents in this study will not be possible. Rather, I used the food guide to understand if adolescents were consuming more fruits and vegetables followed by grain products, followed by milk and alternatives and consume less meat and alternatives and far less oils and fats. Numbers of servings of each food group was not determined in this study.

In examining food consumption in the different food groups recommended by Canada's Food guide it was found that in many of the food groups there was not particularly good compliance with the recommended amount. Fruit and vegetable and milk and milk products consumption was low with consumption of grain products much higher. In looking at the overall food consumption with accordance to Canada's Food Guide, it is apparent that adolescents are not eating the recommended foods and servings. This coupled with the higher reported consumption of foods that contain sweets, fats, and salt is a concern. Likewise the high rate of fast foods that are consumed is a concern. If healthier foods are consumed more frequently then adolescents will less likely chose to

eat unhealthy foods. It is apparent that these unhealthy food groups are being substituted more frequently for healthier foods groups as outlined by Canada's Food guide in both communities. The overall one third reduction in consumption of fats and fried foods among all age and gender groups is encouraging and allows health professionals to further encourage this trend.

While it was difficult to tell if the fast food consumption was the result of these types of foods being mainly available in the schools, if adolescents are in certain environments where this is the predominant food available they may have little choice but to eat fast foods. However, in adolescents, the relation between food preferences and reported patterns of food consumption is also strong (Drewnowski & Hann, 1999) so the findings may indicate preference along with availability. Fast food consumption is problematic as according to McCory and others (1999), those that eat out more than average, have a higher BMI than those that ate more often at home. Evidence of increasing consumption of foods prepared outside the house and its relation to obesity prevalence is largely limited to the U.S., however these conclusions can be extrapolated to other western countries (Binkley, Eales, & Jekanowski, 2000).

One of the factors that I examined under personal coping patterns, could be related to what is termed emotional eating. Emotional eating or eating when not hungry may lead to over nutrition and weight gain in adolescence. Emotional Eating has been defined as eating in response to a range of negative emotions, such as anxiety, depression, anger and loneliness, to cope with negative affect (Faith, Allison, & Geliebter, 1997). It has been identified as a coping style related to diffuse negative emotions, but positive emotions are also reported (Van Strien, Herman, & Verheijden, 2009). The reasons why

adolescents ate when not hungry were quite different in the two communities. Some of the adolescents cited such reasons as being bored or lonely, stressed or anxious, or sad and angry. These findings were similar to Nguyen-Rodriguez, Unger, and Spruijt-Metz, (2009) in that adolescents report emotions as a reason for eating when not hungry. Emotional eating is linked with eating foods that are highly dense in calories, fats, sugars and salt and with less consumption of fruits and vegetables (Nguyen-Michel, Unger & Spruijt-Metz, 2007). The higher percentage of responses to adolescents eating because of boredom and loneliness in the current study may not be considered emotional eating, but rather lack of other activities and resources available to them. This is where parents and communities can volunteer and encourage activities to engage adolescents. Methods on managing stress and coping other than eating need to be addressed.

Physical and social environments make a difference to eating patterns and food consumption. Higher levels of overweight are more likely in rural areas of Canada than in urban areas (Bruner et al., 2008; Plotnikoff, Bercovitz & Louciades, 2004; Veugelers & Fitzgerald, 2005), which is consistent with the findings from the two communities in this study. Adolescents in rural communities are at a risk for overweight and obesity because of multiple risk factors when compared to urban areas. These risk factors include lower socioeconomic status, poor dietary habits and limited recreations facilities, thus decreased physical activity initiatives and maybe be contributing to overweight and obesity (Salvadori et al., 2008). While it was difficult to assess because the students did not know household income, a number of the adolescents had unemployed parents. Overall, both communities had high a prevalence of overweight and obesity, poor eating habits such as skipping of breakfast and other meals, low fruit and vegetable consumption,

eating regular fast foods and patterns of emotional eating. The lack of eating a variety of fruits and vegetables may also be attributed to availability in rural areas and thus lessened accessibility. Community B portrayed less healthy eating behaviours and a higher prevalence of overweight and obesity rates may be explained by the fact the community had a lower socio-economic status. Adolescents in that community also reported worrying with regards to food security and also eating more due to stress and anxiety.

Physical Activity

New guidelines for sedentary behaviour were developed in 2010 by Canadian Society for Exercise Physiology (CESP) and Healthy Active Living and Obesity Group (HALO). These guidelines aim to decrease sedentary time during the day and can be achieved by limiting television screen time to 2 hours per day (less time spent watching television was associated with increased health benefits), limiting sedentary methods of transport such as cars, limiting sitting for extended periods and time spent indoors (Tremblay et al., 2011). According to the guidelines, limiting of sedentary behaviour as much as possible can improve body composition. Sedentary behaviour is the opposite of being physically active. Most adolescents in both communities spent 1-3 hours per school day doing a sedentary activity such as watching television, playing video games or using the computer. Males in both communities were more likely to be sedentary for 1-3 hours. The pattern of sedentary behaviour did not change a great deal in either community regardless if it was the week day or the weekend. Even though Community A had higher levels of sedentary behaviour for both males and females, it still had lower prevalence of overweight and obesity when compared to Community B, which had adolescents spending less time in sedentary activities. These finding are consistent with other studies

that did not observe an association between overall volume of sedentary behaviour with overweight and obesity (Martinez-Gomez, et al., 2010; Purslow, Hill, Saxton, Corder & Wardle, 2008). Many adolescents spent a fair amount of time partaking in sedentary activities and it may be one contributing factor to overweight and obesity rates, but it is difficult in this study to make any direct links. Many adolescents in both communities were not within the sedentary guidelines.

The recommendations by Canada's Physical Activity Guide are that youth ages 12-17 years participate in 60 minutes of moderate to vigorous activities daily (Public Health Agency of Canada, 2012). When data were collected for this study in 2003, the recommendation was 20 minutes of vigorous activity and 30 minutes of moderate activity 4 times a week minimally (Plotnikoff, Bercovitz, & Louciades, 2004). The importance of physical activity in good health is evident by the changes made to the Canadian physical activity guidelines.

In reviewing the findings, adolescents were involved in optimal physical activity guidelines set out at that time, however not when looking at current guidelines. With the use of current guidelines, physical activity may relate to the overall high prevalence of overweight and obesity in both communities. The lower level of physical activity participation correlates to the slightly higher prevalence of overweight and obesity in the communities.

Physical activity reporting cannot be compared to any other NL participation rates and data is limited as noted by Active Healthy Kids Canada, (2010). According to a report by Canadian Lifestyle and Fitness Research Institute found that nationally, females were less active then males and the average adolescent spent 14 hours a week engaging in

physical activity (Craig, Cameron, Russell, & Beaulieu, 2001). These are consistent with my findings that males were overall more active than females. According to Canadian Health Measures survey, males who were not overweight or obese engaged in 65 minutes of moderate-to-vigorous physical activity per day. Among overweight males, the average was 51 minutes, and obese males participated in 44 minutes of physical activity. This was not apparent with females (Statistics Canada, 2011). The same survey found that only 7% of adolescents participate in 60 minutes of physical activity at least 6 days per week and considerably more adolescents participate in 30 minutes of physical activity at least 6 days per week. It is difficult to make to make any direct comparisons, but the findings are similar in that more adolescents spend 30 minutes per activity instead of 60 minutes per activity and meeting physical activity guidelines does not ensure normal weights. However, the more physical activity adolescents engage in they will be more likely have a healthier weight. Adolescent girls in both communities spent approximately 30 minutes in physical activity and the biggest difference was seen in males in both communities.

The most active adolescents, males in Community A also reported more sedentary time. This is not in keeping with the findings of Leatherdale and Wong (2008), who found that lower physical activity was associated with sedentary activity but rather supports the findings of other studies that there was no association with sedentary behaviours and physical activity (Marshall, Gorely, & Biddle, 2006; Sallis, Prockhaska, & Taylor, 2000). Sedentary activities have been positively associated with BMI (Patrick et al., 2004. The physical intensity of the adolescents could not be determined. This may be a more important factor as suggested by Hills, Andersen, and Byrne (2011) than time spent in activities in the prevention of overweight and obesity.

The third research question was are there differences in perceptions, barriers, and benefits related to physical activity in the two communities? It is important to understand attitudes, barriers and perceptions of adolescents in rural communities because the environment is unique when compared to urban areas. Some of the differences between rural and urban areas that may be seen as a clustering of risk factors are: lower socio-economic status, low levels of education, poor dietary habits, limited recreational facilities for physical education, and increased sedentary behaviors (French, Story, & Jeffery, 2001). For these reasons overweight and obesity is highest in rural areas and increasing (Cherry, Huggins, & Gilmore, 2007). In this study I did not collect data in urban areas of NL and thus data from rural communities cannot be compared, however, there are studies that found no differences in physical activity levels between urban and rural adolescents (Plotnikoff, Bercovitz, & Loucaides, 2004; Felton et al., 2002) and some found more physical activity in rural areas (Downs et al., 2012; Simen-Kapeu, Kuhle & Veuglers, 2010). Each province is unique and gaining an understanding of rural communities is vital.

Attitudes toward vigorous activity varied between the two communities. Overweight and obese adolescents who are less involved in physical activities have a less positive attitude (Deforche, De Bourdeaudhuij, & Tanghe, 2006) and this could explain differences as activity levels varied between communities. Adolescents can have both positive and negative attitudes about physical activity and gaining an understanding of both is important when determining how they will rationalize participation in physical activity. Attitudes are important and may determine participation when it comes to physical activity. It seems that adolescents who had a more positive attitude towards

physical activity had higher physical activity rates whereas, those with more negative attitudes towards physical activity had have lower participation time. There are still many adolescents in both communities that have negative attitudes or who are neutral in their opinion towards physical activity. These findings are consistent with Nelson, Benson, and Jensen (2010), suggesting that attitudes towards physical activity have significant, yet modest impact on adolescent levels of activity and that negative attitudes maybe a stronger predictor of participation levels.

Perceived barriers to participating in physical activities may provide insight into actual conditions, either personal or environmental, that could be altered to overcome these barriers to allow adolescents to participate in activities. Barriers that were frequently reported were personal barriers and environmental barriers. There was a wide range of variations in responses. While assessing barriers in adolescents, it may also be necessary to assess motivators as well. Motivators enable adolescents in removing some of the perceived barriers that prevent them from participating in activities. This was evident in the findings where some of the adolescents felt that they did not have the self-discipline or will power to engage in activities. Adolescents may also use barriers as an excuse to avoid participating in physical activities. Body image and feeling comfortable taking part in physical activities were noted by some of the females. These adolescents need to be encouraged and empowered to feel comfortable with their bodies. It has been found that by encouraging adolescent girls, they are able to build their confidence and self-efficacy and reducing the perceived barriers they have (Dishman et al., 2010; Motl et al., 2005).

A number of adolescents reported lack of energy to participate in physical activity and this may be related to poor diets or the fact that their lack of participation in a physical activity is part of the cause of the lack of energy, which can be a vicious cycle. When looking at the responses of the perception of the lack of importance or lack of benefits that physical activity has on preventing adolescents participating in physical activity there did appear to be a great deal of individual variation suggesting that some motivation to change in this respect might need to occur on an individual level.

Predictors of Overweight and Obesity

The fourth and last question was what are some of the predictors of adolescent overweight and obesity among these adolescents? While none of the predictors or independent variables used in the study was significant, I found that males and those who had a parent who were overweight or obese were more likely to be overweight or obese themselves. Additionally those in Community A and in grade 8 were less likely to be overweight or obese that those in Community B and in grade 9. The finding related to gender as discussed above is consistent with other studies that report males are more likely to be overweight or obese than their female counterparts. The finding related to the perception of a parent being overweight or obese suggests that eating practices and what might be considered the norm for weight may be consistent throughout families.

Summary

The prevalence of overweight and obesity was higher in adolescents in both communities when compared to that of most recent studies done in NL and Canada. This study was unable to directly link diet and physical activity to explain or justify overweight and obesity rates in these two communities, however some conclusions can be

made. Overall, adolescents in Community A when compared to adolescents in Community B were a little more likely to consume more fruits and vegetables, spend more time in physical activity, have more positive attitudes and less perceived barriers to physical activity and had slightly lower prevalence in overweight and obesity. Community B overall had lower sedentary time but it did not mean that they had increased physical activity participation or healthier BMI's. The study did provide a good detailed description of the body weights, prevalence of overweight and obesity, food consumption patterns, exercise patterns as well as some of the factors associated with these patterns, and as such provides an important picture in time and baseline data for adolescents in these communities.

Chapter 6

Strengths, Limitations, Implications and Conclusion

Obesity has been on the rise worldwide and has been labeled as being a modern epidemic. The rates of obesity in NL for children and adults are among the highest in the country. The social determinants of health consist of 12 key factors that influence an individual's health as discussed in the introduction. One of these factors is healthy child development and the occurrence of overweight and obesity in adolescents does not suggest healthy development, which will be the foundation for later years. If the percentage of obesity continues to increase as it has been in the last two decades, there will be additional strains placed on the health care system. Health care workers will see increased mortality and morbidity of younger persons from diseases related to obesity such as coronary artery disease, respiratory disease, musculoskeletal disorders and several types of cancers (Reilly & Kelly, 2011).

Adolescents are at a critical stage for developing lifestyles that will continue in adulthood. At this age they are making choices for themselves that will influence the status of their health including being overweight or obese. The choices they make include the types of foods they will consume, what type of physical activities they will engage in and how much time they will spend on these activities. These choices are all modifiable. Some of their choices and perceptions are influenced by external factors as identified by the social determinants of health, i.e., the social and physical environments of the community they live in (urban versus rural), their gender, the income levels of their

parents, and social support from friends, parents and schools that are not all self-modifiable.

In this study, I attempted to present the prevalence of overweight and obesity in two rural communities in NL and explore modifiable determinants of overweight and obesity: diet and exercise. In this chapter I will present the strengths and limitations of the research, as well as the nursing implications for practice, education, and research. This chapter will close with a conclusion.

Strengths

One of the major strengths of this study is that it was the first of its kind to look at this problem in NL. A second major strength is that heights and weights were measured (with the same equipment in both communities) and not self-reported as used in many other studies. Self-reporting often leads to under reporting of actual body weight (Sherry, Jefferds & Grummer-Strawn, 2007). The study was conducted in schools in rural NL where little research exists as often the research has been conducted in urban areas. This study contributes to what we know about rural adolescents and weight as a few studies have been done in other provinces in rural adolescents and the variables that may influence their BMI. The researcher was present during data collection and was available to students to clarify any questions that related to the questionnaire.

Limitations

Design and analysis. Using a cross-sectional design can contribute to uncertainties when attempting to determine the relationships among variables with BMI. A longitudinal study would aid in overcoming such limitations and strengthen evidence of existing relationships. The study had a small sample size because I was limited to the students that

I could access within those communities because of other events taking place in the schools during the time I was collecting data. Therefore, the results may not be indicative of a broader age group of adolescents in those two communities. The results may not be able to be generalized (external validity) to other rural communities in NL or Canada due to the sample size being small and homogeneous. This was a convenience sample and was not random and there were no control groups.

Surveys. The questionnaire was developed for the study and was piloted for ease of understanding the questions and changes were made accordingly. However as presented in the methods section a limitation of the study was the questionnaire was not tested for reliability or validity. Recalling dietary intake and physical activities often is inaccurate and students either under report or over report their responses for a number of reasons; accurate memory being one of them. For example students may have over reported their physical activity levels and under reported their sedentary time and or their poor dietary habits. The questionnaire also needed a better method of asking questions that related to asking of dietary intake and physical activity habits. Dietary intake question could have asked if adolescents ate a certain number of servings of fruits and vegetables. Because of this, it was difficult to compare these adolescents to findings in other studies. While the questionnaire was administered during the fall, many physical activities responses may have been different if the data were collected during another season in the year.

The questionnaire really could not identify SES levels of the students' parents in order to accurately determine the role of SES on BMI. Working status of each individual parent was used as a variable and may not have been the best way to measure for family

economic status because it measured if parents were employed or unemployed. Parents who were employed included full time, part time, and seasonal work but occupations were not captured. In addition, the students did not know and thus were unable to report family income.

Nursing Implications

Nursing Practice

It is evident from this study and other studies related to obesity in adolescents that there is no single factor that can explain the reason for the high rate overweight and obesity. Obesity is a multifactorial condition, however, nurses could assess a number of these factors using a social determinants of health framework.

Nurses are usually the first line of contact for many adolescents that are still in school and thus in a position to play a vital role in monitoring overweight and obesity rates when they are providing school health programs. It is vital that community health nurses are aware of overweight and obesity in their communities and schools, as well as some of the factors that might be associated with this. At the same time, adolescents need to be approached with sensitivity and understanding. Using these principles just mentioned and looking at some of the findings from my study the following could be ways of working with the adolescents. Parents could be included by letting them know patterns of mean consumption and educating them on the importance of healthy eating such as encouraging children to eat regular meals, especially breakfast. They could also be encouraged to be role models by purchasing and eating more fruits and vegetables. Nurses could also educate parents on the importance of engaging adolescents to get an hour of vigorous physical activity per day and the benefits of this. Collaboration between

parents, teachers, nurses, and adolescents to start after school physical activity programs and healthy eating plans in their school can be useful to initiate and sustain these behaviours long term.

Annual assessments are necessary to be completed that includes measurements of height and weight and investigating dietary and physical activity habits. This is needed to note any changes in student practices as they progress throughout their grades in school, because more often weight is put on slowly and often that is difficult to reverse, but if caught in earlier stages may be easier to address. This approach would enable nurses to provide individualized care and follow up for students because some factors might be more important than others in increasing BMIs among students. The findings in this study showed that weight perceptions and actual BMI may not correlate and views of eating a healthy diet may not incorporate adolescents consuming foods according to Canada's food guide. Adolescents will need to be counseled based on their specific needs and approached with sensitivity regarding their misperceptions.

Nurses could also play an active role in mobilizing communities, schools, and government to promote healthy public policies that address availability and accessibility of healthier foods at affordable prices. Physical activity such as organized sports and availability of facilities to students need to be made available and students should be encouraged to participate through campaigns and marketing techniques. Even though this study did not find any significant findings of factors related to BMI, it did show some relationships. It demonstrates the positive (although small) effect of gender, community, vegetable intake, physical activity and parental employment (SES) on adolescent BMI.

While the prevalence of obesity has been in the headlines for the last several years, nurse educators could do much to translate research for the average nurse who often may not be familiar with understanding research findings of studies such as this. Part of this translation includes comparing and presenting findings of other studies to highlight that there are differing relationships between factors or variables that influence BMI. These factors may or may not be valid for each adolescent who is overweight and obese but it allows the nurse to realize that obesity is complicated and often is a combination of several factors. Being educated and informed on the subject allows nurses to make informed decisions while caring for the community and individuals.

Nursing Education

Overweight and obesity has emerged as a major health concern for adolescents within the last two decades. Basic nursing education should incorporate the importance of nutrition and exercise in the context of healthy children and adolescents. A module would be ideal to develop for students in the Bachelor of Nursing program as part of their Health Promotion course. The module could be a compilation of journal articles that study overweight and obesity and include a variety of variables that may be viewed as risk factors. Students would benefit from case studies and also practicums if possible. Nursing students need to appreciate the importance of attitudes, perceptions, and barriers in the assessment process because without realizing and addressing them the health promotion activity may not be successful. Nursing students may also need to learn communication skills on how to approach and speak to adolescents in a non-threatening and non-judgmental approach.

Nurses that are already working in the communities could engage in continuing education programs sponsored by their health boards to gain more knowledge and skills surrounding adolescent obesity such as diet and physical activity guidelines. Continuing education courses can be set of as modules with each determinant of health and its relation to adolescent obesity. This would highlight the complexity of the overweight and obesity epidemic and that nurses need to pay attention to all aspects of an adolescents life when assessing and counseling. Seminars, education days, and also telephone conferencing with other nurses across the province would be beneficial in sharing their experiences of what they have found effective and also share their challenges and seek guidance from experts in the area.

Nursing Research

This study could be replicated with limitations addressed or used as a basis for further expansion of studies related to obesity, dietary intake, and physical activity in rural Newfoundland. Measurements of some of the determinants of overweight and obesity could be refined. It is evident that overweight and obesity are important issues and further studies that better measure and thus factors that influence weight need to be conducted.

Future studies may include larger sample sizes involving several rural and urban communities in NL for the results to be generalized. Also, future studies may want to use three different growth reference charts commonly used to assess weight status as published by the CDC, WHO and IOTF. Research of this nature may tighten the gap of the current discrepancies in the literature that look at defining the prevalence of overweight and obesity by providing data that would lead to a definition that is widely

accepted. Qualitative studies also need to be conducted in the area because there is a lack of these in the current body of knowledge that can be used to generate theories or hypotheses to better understand the complex and interconnectedness of variables on obesity.

It would be important for researchers not only to conduct longitudinal studies but also some intervention studies using control groups to follow students who are overweight and obese and determine some of the best ways to effectively manage these problems. Research such as this allows for evidence-based practice and to assist nurses and others to work with adolescents on healthy weight management techniques that are supported by research. The data provided from these studies also enables government and policy makers to justify monetary allocations for programs and services related to achieving and maintaining healthy BMIs throughout the lifespan.

Conclusion

Overweight and obesity is a complicated condition that cannot be explained by one single factor. Often, it is the intertwined combination of several social determinants of health. The role of genetics is growing in this area. It is important to understand the challenges faced by adolescents in eating healthy and participating in the recommended physical activity daily to remain healthy, but equally important to understand some of the factors that influence these behaviours. By understanding these challenges, nurses can collaborate with communities in addressing these issues by educating and developing programs that will help curb the increase of overweight and obesity.

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APPENDIX A: QUESTIONNAIRE

Physical Activity and Nutritional Intake Questionnaire

Please answer questions as honestly and as accurately as you can.

Pregnant women will be excluded from this study.

This questionnaire is confidential. Please do not write your name on any pages.

***STUDY NUMBER*_____**

About you:

How old are you? _____ years

Are you: 1) Male ____ 2) Female ____

Are you pregnant or have had any recent weight changes due to illness? Yes ___ No___

Which grade are you in? 10 ___(1) 11___(2) 12___(3)

Which community do you live in? Arnold's Cove ___(1) Bonavista ___(2)

Nutritional Intake

1. How many times during the past 2 weeks (14 days) did you eat the following meals? (Please circle)

Breakfast 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Lunch 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Supper 1 2 3 4 5 6 7 8 9 10 11 12 13 14

2. What types of food did you eat for breakfast in the last 2 weeks? Please tick.

1) ___Cereal/bread/toast/oatmeal/pastries/waffles/pancakes

2) ___juice/fruit

3) ___tea/coffee

4) ___milk/cheese//yogurt

5) ___bacon/ham/eggs/or other meat

6) ___other please list_____

3. If you do not eat breakfast more than 5 times per week, what stops you from eating this meal?

1) not enough time ___

2) not hungry ___

3) other please list ___

4. In the last year, have you been eating (circle the number):

	More	Less	Same amount as before
Sweet foods and candy	1	2	3
Fats and fried food	1	2	3
Salts and salty food	1	2	3
Three meals a day	1	2	3
The same amount of food or calories	1	2	3

5. Do you eat fast foods (McDonalds, fish and chips, take out food, food bought in restaurants, vending machines, school or convenience stores)?

1) Yes ___ How many meals in the last 2 weeks?___
2) No ___

Food Frequency Tables:

Regularly: eaten 4-7 times per week

Frequently: eaten 1-3 times per week

Occasionally: eaten 1-3 times per month

Never: not eaten at all

Meat/Poultry/Fish	Regular 4-7 X per week	Frequent 1-3 X per week	Occassional 1-3 X per week	Never
Eggs				
Ham/pork roast				
Bacon				
Luncheon meats (bologna, salami, turkey breast, roast beef, ham, chicken loaf)				

Meat/poultry/fish	Regular 4-7 X per week	Frequent 1-3 X per week	Occassional 1-3 X per week	Never
Fish sticks or any other breaded frozen fish or chicken product				
Tuna fish				
Chicken				

Beef				
Turkey				
Moose/caribou/other game				
Other please list				
Other please list				

Meat substitutes	Regular 4-7 X per week	Frequent 1-3 X per week	Occassional 1-3 X per week	Never
Beans and lentils (pinto, pea soup kidney beans, chick peas				
Nuts |(peanuts, cashews, almonds, etc.)				

Vegetables/Fruits	Regular 4-7 X per week	Frequent 1-3 X per week	Occassional 1-3 X per week	Never
Canned vegetables (peas, corn, green beans, etc.)				
Fresh beans/peas				
Vegetable juices/fruit juices				
Carrots/turnips/cabbage				

Vegetables	Regular 4-7 X per week	Frequent 1-3 X per week	Occassional 1-3 X per week	Never
Broccoli/cauliflower/green and red peppers				
Leafy green vegetables (lettuce, spinach, etc.)				
Cucumber/celery/tomatoes/mushrooms				
Apples/oranges/kiwi/banana/graefruit				
Grapes/mango/avacodo				
Peaches/pears/plums				
Blueberries/strawberry (other berries)				
Potatoes mashed, baked, in soups/salads (except French fries or chips				
Other vegetables or fruits please list _____ _____ _____				

Dairy Products	Regular 4-7 X per week	Frequent 1-3 X per week	Occassional 1-3 X per week	Never
Ice cream/ milk shakes				
Milk				
Cheese				
Butter				
Yogurt				

Grains/Starches	Regular 4-7 X per week	Frequent 1-3 X per week	Occassional 1-3 X per week	Never
Rice				
Waffles/pancakes				
Muffins/cakes/donuts/pies/ brownies/cookies/crackers				
Bread/bread rolls/pitas				
Pasta				
Rice				
Potatoes (chips, French fries, hash browns, taters)				

Miscellaneous	Regular 4-7 X per week	Frequent 1-3 X per week	Occassional 1-3 X per week	Never
Pop/ hot chocolate				
Fried chicken/wings/onion rings/fried fish				
Chocolate/candy				
Pop corn				
Hamburgers				
Pizza				
Nacho/dip				
Gravy/thick creamy sauces/salad				

dressing/margarine/ butter				
Salt beef/ Salt pork				
Soups				
Salads				
Peanut butter				
Jam/jellies/syrup				
Other please list:				

7. Rate your preference for eating the following food groups by circling the number.

Food group	Extreme Dislike	Dislike	Take it/leave it	Like it	Favorite food
Bread/cereal/pasta/rice	1	2	3	4	5
Cookies/cakes/sweets/pies/donuts	1	2	3	4	5
Fast food/restaurant food	1	2	3	4	5
Fish	1	2	3	4	5
Vegetables	1	2	3	4	5
Milk/cheese/yogurt	1	2	3	4	5
Pork/beef	1	2	3	4	5
Snack foods/popcorn, chips	1	2	3	4	5
Chocolate/chips	1	2	3	4	5

8. How do you feel about your eating habits?

1) extremely healthy
2) somewhat healthy
3) fairly healthy
4) somewhat unhealthy
5) extremely unhealthy

9. When do you feel you eat the most when you are not hungry?

1) when you are stressed/anxious/worried
2) when you are sad
3) when you are angry
4) when you are bored or lonely
5) other please specify _____
6) never

10. At present, do you smoke cigarettes every day, occasionally or have you stopped smoking?

1) everyday
2) occasionally
3) stopped
4) have never smoked or do not smoke cigarettes

11. How many cigarettes do you smoke?

1) daily _____
2) weekly _____ (If you smoke daily)

12. Do you consider yourself to be:

1) very overweight
2) somewhat overweight
3) right weight
4) somewhat underweight
5) very underweight

13. Which of the following are you trying to do about your weight?

1) lose weight
2) gain weight
3) stay at the same weight
4) not trying to do anything about my weight

14. Think about the stress in your life. Would you say most days (more than 3-4 days per week) you are:

1) not at all stressed
2) not very stressed
3) quite a bit stressed
4) extremely stressed

15. How do you deal with stress in your life? (You can circle two options)

1) take part in physical activity and sports
2) eat more food
3) talk to friends and family
4) watch tv, play Nintendo or go on computer
5) drink alcohol
6) smoke more under stress
7) other please specify _____

16. Would you consider either one of your parents to be overweight?

1) Yes
2) No

17. Do you feel that you have healthier food choices available to you at home and at school?

1) Yes
2) No

18. In the last 12 months (1 year) did you or anyone in your home:

a. Worry that there would not be enough to eat because of a lack of money?

1) Yes ___ 2) No ___

b. Not eat the quality or variety of foods that you wanted because of lack of money?

1) Yes___ 2) No___

c. not have enough food to eat because of a lack of money?

1) Yes ___ 2) No

19. In the past year, how would you judge your weight?

1) gained 1-5 pounds
2) gained 6-10 pounds
3) gained more than 10 pounds
4) lost 1-5 pounds
5) lost 6-10 pounds
6) lost more than 10 pounds
7) stayed the same

20. At present, what is the working status of your father?

1) working full time (working 30 hours or more in one week)
2) working part time
3) unemployed (not working and looking for a job
4) retired
5) a student or retrainin
6) looking after house
7) on disability (other form of income from government)

21. At present, what is the working status of your mother?

1) working full time (working 30 hours or more in one week)
2) working part time
3) unemployed (not working and looking for a job
4) retired
5) a student or retraining
6) looking after house
7) on disability (other form of income from government)

22. What is the total combined income (money earned) of your mother and father in the last year?

1) less than $10,000
2) $10,001-$20,000
3) $20,001-$30,000
4) $30,001-$40,000
5) $40,001-$50,000
6) $50,001-$60,000
7) $60,001-$80,000
8) $80,001-$100,000
9) Above $100,001

Physical Activity

23. On an average school day how many hours in total do you spend on computer, playing video games and watching television?

1) don't spend any time doing these activities
2) less than 1 hour
3) 1 hour
4) 2 hours
5) 3 hours
6) 4 hours
7) 5 or more hours

24. How much time in do you spend on computer, playing video games or watching television on the weekend?

1) don't spend any time doing these activities
2) less than 1 hour
3) 1 hour
4) 2 hours
5) 3 hours
6) 4 hours
7) 5 or more hours

25. From the list provided below please list the activities that you have participated in during the last 4 weeks. ***The activity should have lasted for 20 minutes and made you breath hard, sweat, and increased your heart rate.*** Please fill out the table provided.

Activity	How many times Per week	Minutes spent doing activity	Setting where activity played
1) aerobics			
2) baseball			
3) basketball			
4) bicycling			
5) bowling			
6) curling			
7) dancing			
8) fishing			
9) football			
10) gardening			
11) golfing			
12) hiking			
13) hockey			
14) hunting			
15) jogging			
16) kayaking			
17) pushups			
18) jogging			
19) racket ball			

20) roller blading			
21) rowing			
22) running			
23) snow shovelling			
24) sit ups			

Activity	How many times Per week	Minutes spent doing activity	Setting where activity played
25) skating			
26) skiing			
27) soccer			
28) softball			
29) stair climbing			
30) stepper			
31) stretching			
32) tennis			
33) treadmill			
34) volley ball			
35) video tape workouts			
36) walking briskly			
37) weight lifting			
38) yoga			

Other please specify_____

26. Compared to the way other people your age spend their spare time, would you say you are:

1) much more active
2) more active
3) about the same activity level
4) less active
5) much less active

27. With whom do you usually do your physical activities with in your spare time?

1) no one
2) friend
3) parents or sibling
4) classmates
5) other

28. Where do you usually do your exercise or physical activity in your spare time?

1) home
2) park
3) recreational facility (ex. YMCA)
4) outside
5) school or college gym
6) other please list _____

29. How important are the following in preventing you from being more physically active. Please fill in the table by ticking the box that fits you.

Question	Not important at all	Not so important	Important	Slightly Important	Very Important
Lack of time due to work/school	1	2	3	4	5
Lack of time due to home chores/responsibilities	1	2	3	4	5
Lack of time due to other interests/hobbies	1	2	3	4	5
Lack of energy/ too tired	1	2	3	4	5
Lack of athletic ability	1	2	3	4	5
Lack of programs, leaders or accessible facilities	1	2	3	4	5
Lack of partner or someone to workout with	1	2	3	4	5
Lack of support from family/friends/school	1	2	3	4	5
Too expensive	1	2	3	4	5
Lack of self discipline or will power	1	2	3	4	5
Self conscious, not comfortable with self	1	2	3	4	5
Long term illness/disability or	1	2	3	4	5

injury					
Fear of being injured or hurt	1	2	3	4	5
Feel that physical activity is not important/beneficial	1	2	3	4	5
Poor weather conditions	1	2	3	4	5

30. How do you go to and from school 3 times or more per week?

1) school bus
2) walk
3) parents drive you in a car
4) bicycle
5) scooter/skate board/roller blades
6) other please specify _____

31. If you are not already physically active, which of the following options provided would help you seriously start and stay with a physical activity program? (Check 3 options)

1) nothing
2) better or closer facilities
3) different and less expensive facilities
4) more information from school and other sources on how exercise improves health
5) more school based sports/exercise programs during school time
6) more after school gym/exercise programs
7) people to participate with
8) common interest with friends to exercise and work out
9) more time available
10) motivation and encouragement from teachers/parents/friends
11) organized fitness/sports classes provided by community
12) other please list _____

32. How do you feel about participating regularly in vigorous physical activity? Circle the number that describes how you feel?

Boring	1	2	3	4	5	Fun
Harmful	1	2	3	4	5	Beneficial
Unpleasant	1	2	3	4	5	Pleasant
Inconvenient	1	2	3	4	5	Convenient
Painful	1	2	3	4	5	Not Painful
Difficult	1	2	3	4	5	Easy

34. How much does/or would participation in physical activity help you to .....

	A great deal				Not at all
Relax, forget about your cares	1	2	3	4	5
Get together with other people	1	2	3	4	5
Have fun	1	2	3	4	5
Get outdoors	1	2	3	4	5
Compete, win	1	2	3	4	5
Feel Independent	1	2	3	4	5
Feel better mentally	1	2	3	4	5

Feel better physically	1	2	3	4	5
Challenge your abilities, learn new things	1	2	3	4	5
Look better	1	2	3	4	5
Control/lose weight	1	2	3	4	5
Improve/maintain physical fitness	1	2	3	4	5
Improve/maintain your heart	1	2	3	4	5
Improve/maintain muscle strength	1	2	3	4	5

Separate Page

***STUDY NUMBER*_____**

***Height*_____**

***Weight*_____**

NOTE: Original questionnaire was on legal sized paper with appropriate layout for ease of response.

Memorial
University of Newfoundland

APPENDIX B: ETHICS APPROVAL

Office of Research and Graduate Studies - Medicine
Faculty of Medicine
The Health Sciences Centre

May 20, 2003

TO: Ms. J. Sharma

FROM: Dr. F. Moody-Corbett, Assistant Dean
Research & Graduate Studies (Medicine)

SUBJECT: Application to the Human Investigation Committee - #03.39

The Human Investigation Committee of the Faculty of Medicine has reviewed your proposal for the study entitled "**Obesity, eating patterns and physical activity among high school student in selected areas affected by the cod moratorium**".

Full approval has been granted for **one year**, from point of view of ethics as defined in the terms of reference of this Faculty Committee.

For a hospital-based study, it is **your responsibility to seek necessary approval from the Health Care Corporation of St. John's**

Notwithstanding the approval of the HIC, the primary responsibility for the ethical conduct of the investigation remains with you.

F. Moody-Corbett, PhD
Assistant Dean

FMC/jjm

cc: Dr. C. Loomis, Vice-President Research, MUN
Dr. R. Williams, Vice-President Medical Services, HCC

VISTA

APPENDIX C: LETTER FROM SCHOOL BOARD

August 20, 2003

Ms. Jyoti Sharma
School of Nursing
Memorial University of Newfoundland
St. John's, NL

Dear Ms. Sharma:

I am pleased to inform you that permission is given to conduct the study "Obesity, eating patterns and physical activity among high school students in selected areas affected by the cod moratorium".

It is important that you contact the principals of Discovery Collegiate and Tricentia Academy directly and set up a convenient time to conduct the study.

I would like to wish you luck in conducting this study.

Yours truly

Allan Fudge
Assistant Director of Education (Programs)

/smf